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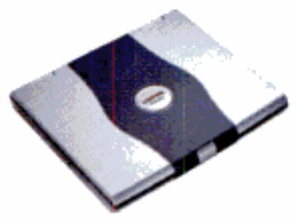

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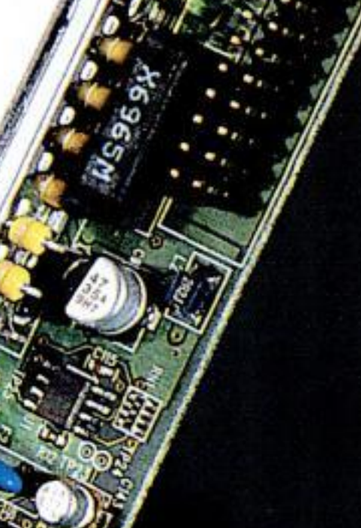

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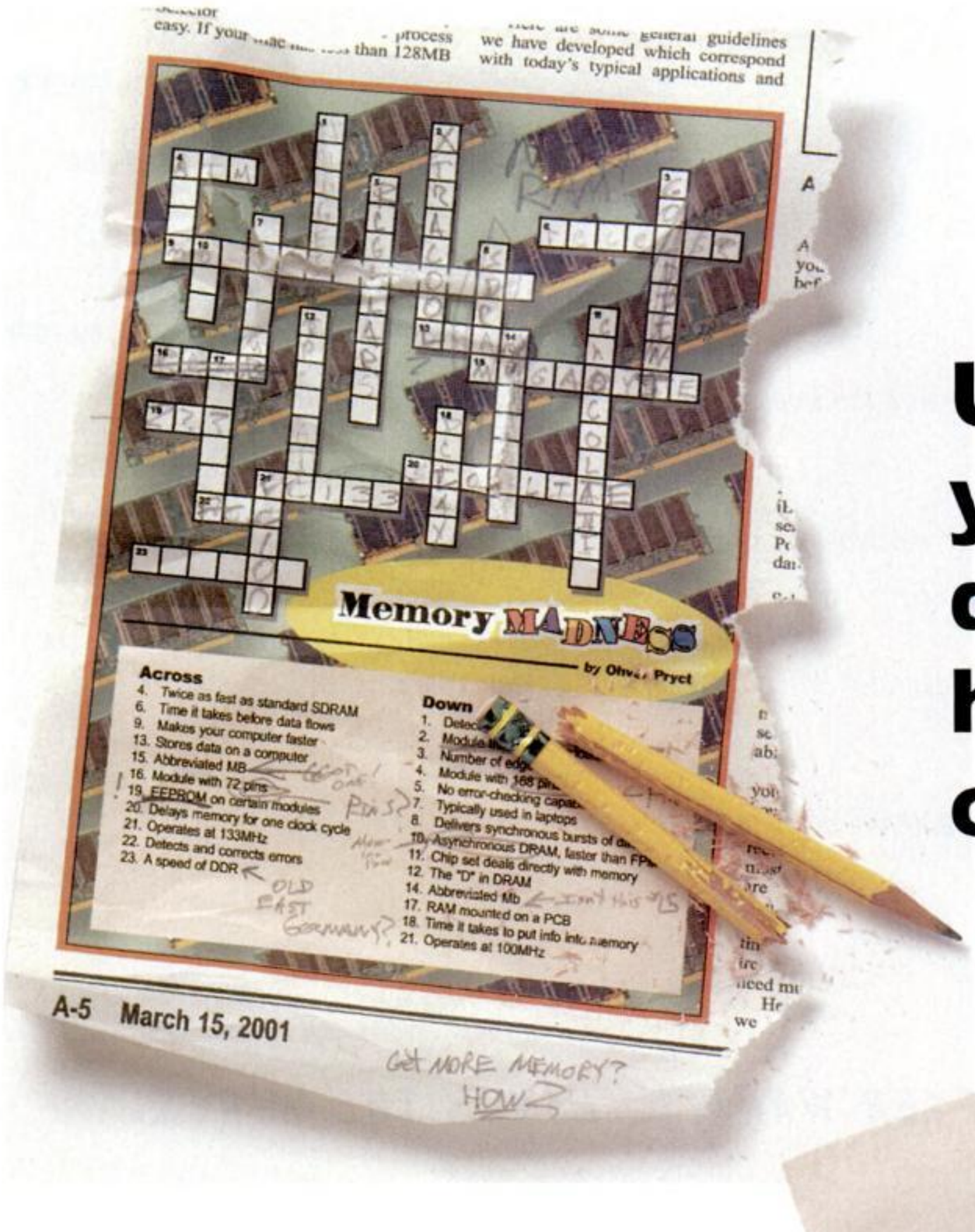

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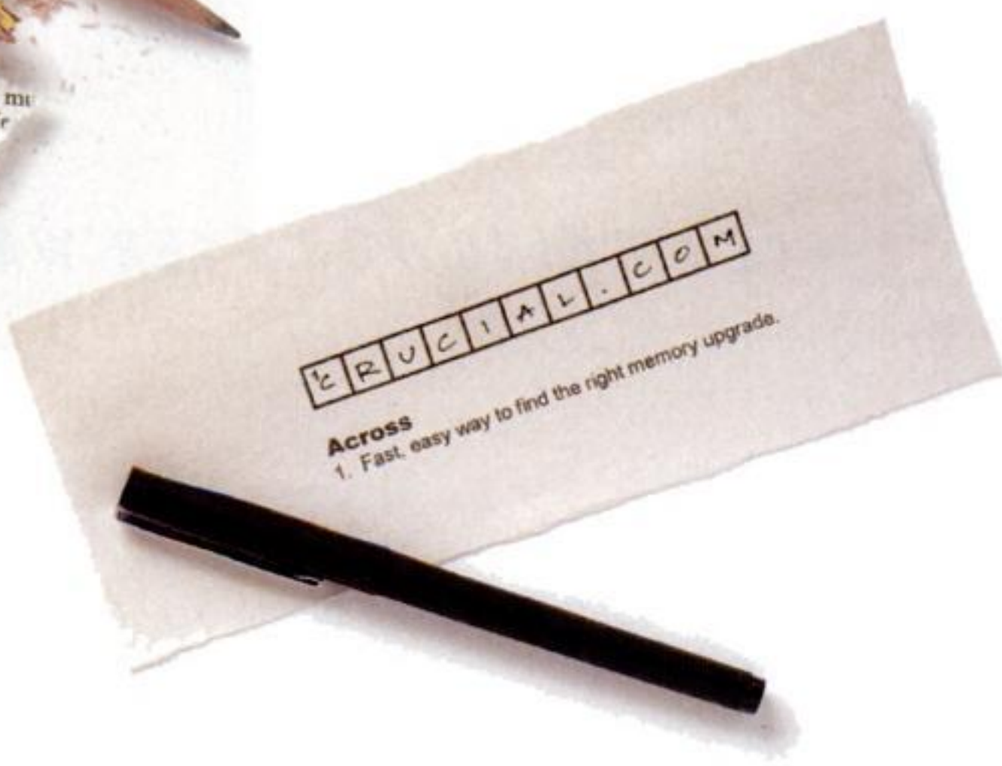

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Release Notes

Tommy, can you read me?

And we thought the Mrs. Schartung incident was controversial.

When Tech Editor Will Smith referred to Mrs. Schartung, his high school chemistry teacher, in an ambiguous explanation of benchmark results, readers took him to task with an avalanche of letters to the editor. My in-box was flooded with a truly unprecedented amount of e-mail.

But, quite fortuitously for Will's own peace of mind, the brouhaha he created in the May issue was ultimately eclipsed by the brouhaha we *all* created in the June issue. It turns out that most of you liked our content changes last month, but were vehemently opposed to our design changes—or, rather, one very specific design change: the move to smaller type in many parts of the magazine. Boy-o-boy, did the complaint letters flow.

Let's get one thing straight: Editors can't let critical e-mails dictate the direction of a magazine. Complaint letters are anecdotal evidence, not empirical survey data, and they sometimes come from a vocal (albeit passionate) minority. But other times, complaint letters do suggest a legitimate trend. Especially when they arrive by the 10s and 20s every day. It would be foolish and arrogant to dismiss the cries for larger type, so, starting in next month's issue, we'll be bumping up the point sizes of our smallest type. Sure, we won't be able to stuff as much content into our pages, but at least everyone will be able to read the content that *does* appear in the magazine.

Starting in next month's issue, we'll be bumping up the point sizes of our smallest type.

To make sure all readers are aware of this change, I repeat the above information in our In/Out letters section—because, who knows, the type in this column might be too small for some people to read!

So what's on the cover of *your* magazine this month? Now, you'd think that I, of all people, would know what's on your cover. But, this month, newsstands across North America are selling two different covers, one featuring our "Digital Darkroom" feature, the other our "Wild Cards" feature. The cover you're holding depends on the newsstand you buy from. Why two different covers? Simple: We want to know which topic sells better, digital cameras or videocards. Now, *this* is an empirical reader-interest study that we'll definitely pay attention to.

—JON PHILLIPS

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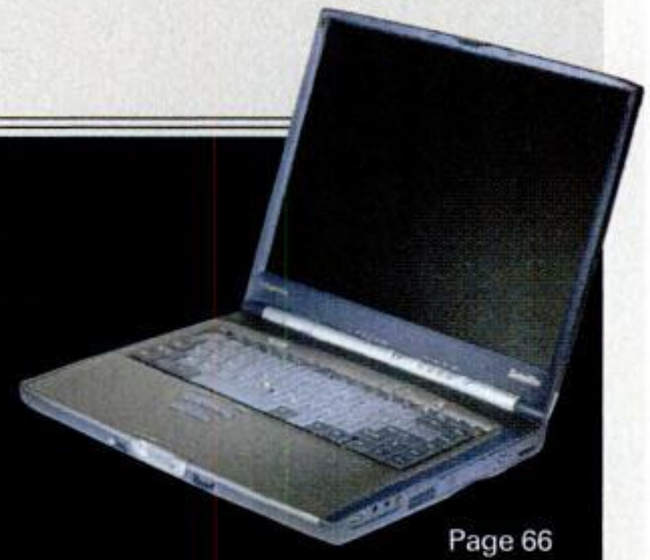

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FEATURES

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Five big, pretty pictures that show you why programmable shaders make games better.

50 Protect & Destroy

We show you how to keep the feds outta your personal files, and how to destroy incriminating digital evidence before they break down your door.

COVER FEATURES

Digital Darkroom

Is it time to ditch film? From making an initial camera purchase to shooting stills to making prints you can mail to Mom and Dad, we tell you everything you need to know to maximize your digital-photography experience.

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Wild Cards

Videocards aren't just for 3D gaming anymore. We introduce you to five graphics wonders that let you grab video, watch HDTV, or even build bridges. Find out which will fulfill your video dreams, and what you'll need to get full enjoyment from the latest silicon marvels.

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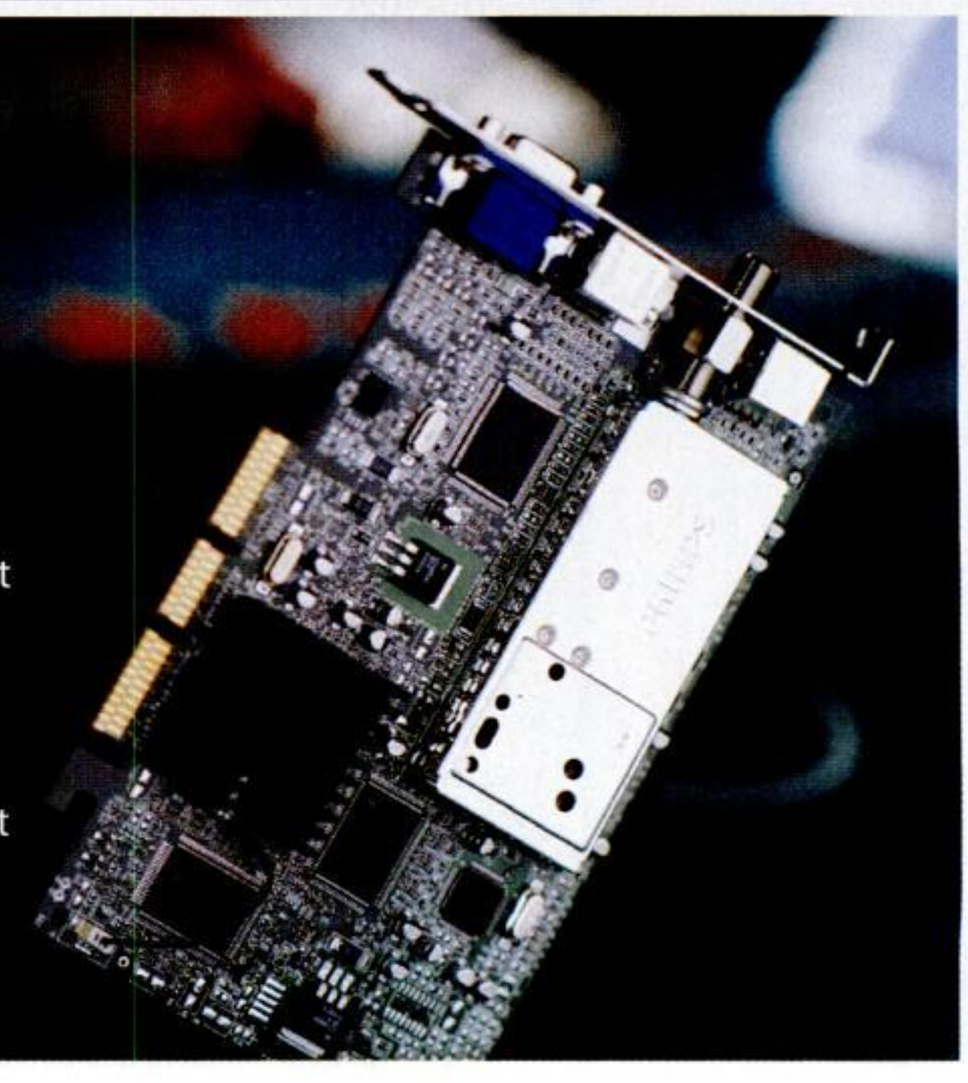

JULY 2001

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In/Out

You write, we respond

90 Degrees of Separation

It looks like the new design was done by someone who doesn't read many magazines. Who wants to turn the magazine 90 degrees to read about monitors? I liked the old format better.

—Steve Shoyer

JON PHILLIPS RESPONDS: *We* actually liked the vertical layout—but coping with it in *Quark Xpress* was a major hassle. *Quark* doesn't have a "rotate page" command, and none of our current production monitors can flip to portrait mode. But Kristen did MacGyver her own solution...

OUR NEW LOOK: THE PLAY-BY-PLAY

I wanted to take a moment to comment on the new look of *Maximum PC*:

- In/Out: The CommPort section was getting old. The new section seems more succinct. Net change: Positive.
- Quick Start: If this takes the place of Spin Cycle, it's a definite improvement. But, the Windows Tips article was a bit abrasive. Net change: Positive.
- Fast Forward and Game Theory: This isn't the place to save space. I doubt Tom Halfhill could have done a story on the Pentium 4 given the current size of his column. Net change: Negative.
- Head2Head: Concise and inclusive, and I appreciated the "long-term prognosis" appraisal of each storage medium. Net change: Positive.
- Scatter Shots and Plug-and-Play: Useful information on items that don't require a full-page review. Net change: Positive
- Exit: Much better than the old Glitch. Net change: Positive.
- Mastering Your PDA: A good article that changed my opinion about the PDA I would want to buy.
- Operation Retrofit: The variety of machines included was wide enough to allow me to extrapolate the best course of action for several of the computers I use.
- Size Matters: Information about technologies I may not hear about elsewhere is one of the reasons I value your magazine enough to pay for it.
- Reviews: Easy-to-read and complete. The "what we like/what we hate" language is much more personable than "pros and cons."

Summary: five positives, one negative. In all, I think the changes improve *Maximum PC*, and I will once again be renewing my subscription.

—Warren Grable

Do I really need to be insulted by someone who obviously hasn't figured out how to use Windows Explorer to search his hard drive?

EDITORS WITH BIONIC EYES

Review topic: The "new look" of *Maximum PC*. What we like: The ability to print the entire *Webster's Dictionary* on a gnat's ass with the new font. What we hate: Paying for a new eyeglass prescription.

—Rick Mercier

JON PHILLIPS SHOUTS: Other readers complained about the small type in the June issue, and it's clear to us that larger type is in order. Unfortunately, by the time the complaint letters began arriving, it was too late to effect global changes throughout the July issue. Rest assured, in the next issue you'll see larger type.

SEE DICK FLAME

What the hell were you thinking with "Windows Tips for Morons" [June 01]? I don't know who Dick Matthews is, but I don't like him, and the MCSE after his name does nothing to improve the reputation of individuals in tech support. Do I really need to be insulted by someone who obviously hasn't figured out how to use Windows Explorer to search his hard drive? If you're going to cater to newbies with "Stupid Computer Tricks," then help them without insulting them. I'll be just fine if Dipstick Dick never talks to us again.

—Mark Miller, via the *Maximum PC* online forums

ALL-AROUND JACKASS DICK MATTHEWS, MCSE, RESPONDS: Unfortunately, my most ineffectual friend, Jon Phillips (the boob who runs this outfit) has signed me on for an indefinite stint to protect power users from their own pathetic Windows deficiencies. Now you might know your way around the Windows interface, because this is your duty as an automotonic office drone. Chances are, when your pitiable life reaches its inevitable *American Beauty*-like conclusion, you'll still be reciting Windows shortcuts to yourself—because that's your job.

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That's what you do. But I can't tell you how many "power users" I've encountered who can overclock a motherboard with their hands tied behind their backs, but have no concept whatsoever of Windows' many hidden secrets. These people need schooling—and I'm the man who'll learn 'em proper.

And you know what, Millhouse? It really, really hurts to read that you think I'm insulting.

OUT WITH THE OLD!

In response to "Operation Retrofit" [June 01]: You weren't even in the ballpark when you recommended $500 upgrades for those machines! You'd be better off spending that kind of cash on a new system—one that would blow the plastic bezels off any of the three systems you upgraded. As machines get faster and prices drop, it's senseless to upgrade any computer that's more than a year old. Your readers will attempt these upgrades, then get ticked when their systems start putt-putting again in two months.

—Dave Meredith

GORDON MAH UNG RESPONDS: You'll get no argument from us that the three machines were far behind today's muscle boxes, but not everyone is willing to toss out a machine they "just bought" a few years ago. If upgrading your PC gets you another year of life, it's worth it. While it won't float my boat anymore, the old Athlon 700MHz we upgraded will bring plenty of joy to my sister, and is far from decommissioned. If you bought a 1GHz Thunderbird Athlon or 1GHz Pentium III one year ago, do you really advocate throwing away the entire machine when popping in a GeForce3 will hold you over for another six months?

FLASHIN' A LITTLE BIOS

I loved "Operation Retrofit," especially the HP Pavilion 8260 upgrade. However, you may have missed out on a great upgrade secret. Not too long ago I was upgrading a similar old system that had a 266MHz processor on a Tekram motherboard. Like your HP system, it included the Intel LX chipset. A little research at the Tekram web site showed me that a BIOS flash was available for the motherboard, and that CPU multipliers not listed in the original owners manual were now functional—up to X8! I was able to upgrade my system from an overworked 266 to a very solid Celeron 533MHz. Not bad, huh?

—Gary Feiman

GORDON MAH UNG RESPONDS: That's a pretty good trick. Unfortunately, our board was a special OEM version by Asus, and was neither very well supported nor documented. We did consider jamming a Celery in there, but God help us, we couldn't find an old PPGA Cellie anywhere in the San Francisco Bay Area. I don't think the newer low-voltage FCPGA "Coppermine" Celerons would last that long given the board's high voltage.

YOU HATE US, YOU REALLY HATE US!

As we put this issue to bed on Friday, May 25, our first "Hate Mail of the Month" contest was still open for entries. Are you wondering what your hate mail entry should read like? Here's a stellar early example (and, who knows, by the time the contest is over, Mr. Chapman might actually win!):

Dear constructors of the unconscionable,

As I gaze upon this putrid issuance from the very anus of evil itself, I am moved by the soul-leeching void of your incomprehensibly wide two-inch margins. My eyes scream in agony as their muscles are forced to constrict painfully to read the excruciatingly small print in the verdict boxes, seemingly etched on the side of any random molecule.

Articles, once luxuriating across an entire page, have been run through a linguistic abattoir, then mercilessly wedged onto the page like a 200-pound woman in size-five spandex. "But, there are more reviews!" cry the blissfully ignorant. Never mind the fact they're no longer than your average business card (about as deep, too). Would that I could continue, but my heart-wrenching despair, brought on by this latest effort, has left me at a loss...

Ubiquitously absent,
Doug Chapman

If you'd like to enter our Hate Mail contest, go to www.maximumpc.com for the full set of elaborately stringent rules.

CUT, COPY, PASTE

Due to a production error in the April 01 issue, we incorrectly indicated a frame rate score in the Intel D850GB motherboard review. The correct *3DMark2000* score is 87.1fps.

The Princeton monitor featured on page 48 of the June issue is actually the Ai3.6HD, not the AV3.6. The Ai3.6HD costs $3,500. ■

The Last Word on Will's Fuzzy Math

It was great to learn that Will is thriving in California and still remembers taking chemistry in the 10th grade. He was an excellent student and I'm very proud of his achievements. However, he oversimplified the percentage difference equation [in his May 01 CommPort response]. To properly apply the formula, you have to identify which number in the problem is the base, or reference, number. If you allow x to be the base (it may or may not be the larger number), then y is the compared value. Your formula would then be:

(y-x)/x X 100%. The larger number will be positive (showing increased value) if x is the smaller number, or negative (showing decreased value) if x is the larger number. Thus, regarding the problem that's been in question: (20.3fps-4.5fps)/4.5fps X 100% = 351%.

Sorry, Will—I can't back up your "fuzzy math," but I wish you the best in your career. It made my day to learn from [Will's] dad that his degree is in biochemistry! Kids like him made teaching worthwhile.

—Joan Schartung, a.k.a. "Mrs. Sharp Tongue"

LETTERS POLICY: MAXIMUM PC invites your thoughts and comments. Send them to **input@maximumpc.com**. Please include your full name, town, and telephone number. Letters may be edited for space and clarity. Due to the vast amount of e-mail we receive, we cannot personally respond to each letter.

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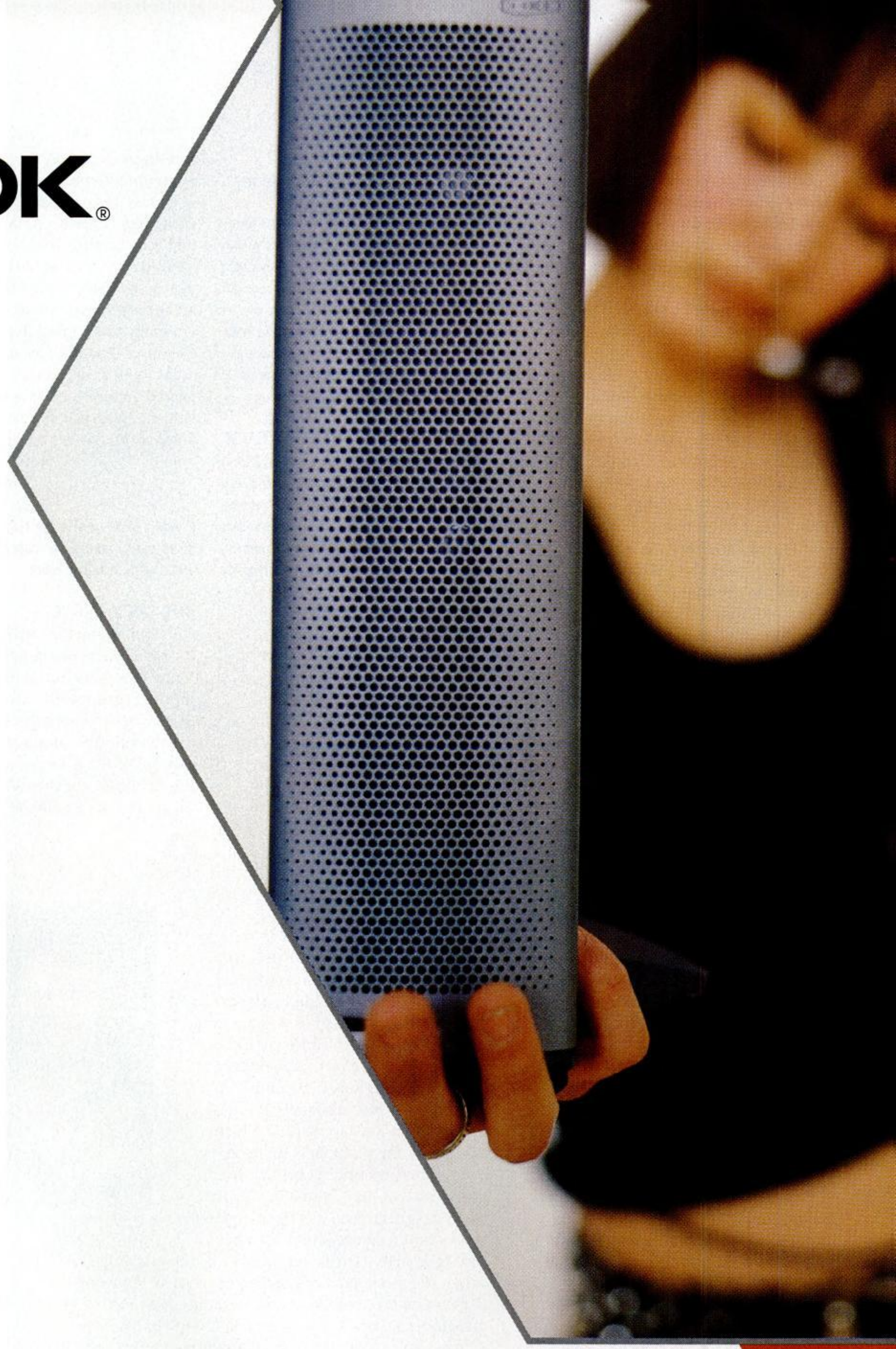

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Quick Start

The beginning of the magazine, where articles are small

TECH PREVIEW: OPERATING SYSTEM

The Light and Dark Sides of WindowsXP

Is your OS God an Old Testament fire and brimstone kind of God or a benevolent George Burns kind of God? Herein we explain the good and bad sides of Microsoft's revolutionary new WindowsXP operating system, which is due to hit desktops this October.

THE LIGHT SIDE

NT KERNEL: Even God gets sick of Blue Screens of Death. So, to reduce fatal system crashes to a manageable level, XP finally moves consumers to a pure, 32-bit code base, care of the time-tested and stable NT kernel.

BETTER GAMING: Windows 2000 and NT are famous for breaking games that run fine in Windows 98. But XP emulates key aspects of earlier consumer Windows OSes so that your games will see Registry entries exactly where they expect them to be. XP thus promises gaming support that never quite jelled in Win2000 and NT.

NEW INTERFACE: Say goodbye to 3D objects. XP sports a much flatter user interface that's damn near retro in its cutting-edge appeal. You'll also have the chance to "skin" the OS to give it any look you choose.

24-HOUR ROAD ASSISTANCE: A new remote-assistance mode lets other XP users take over your PC—after you invite them to do so by e-mail. Security precautions will hopefully prevent someone from comp-jacking your PC.

NATIVE BURNING SUPPORT: Windows XP includes improved UDF support for DVD discs, better DVD-RAM support, and the ability to burn CD-R and CD-RW media without additional software.

BETTER MEMORY SUPPORT: Like NT and 2000, XP lets consumers effectively use 1GB or more of system memory. In Win98, you could run this much RAM, but it never paid off in worthwhile dividends. Once again, the NT kernel provides consumers with a new world of computing.

SHARPER LETTERS: XP will have native support for Microsoft's sub-pixel rendering technology, which increases the resolution of screen fonts on LCD monitors.

FIRE IN THE DARK SIDE

PRODUCT ACTIVATION: Microsoft's First Commandment is "Thou shall not pirate." XP ties the OS to your hardware platform, effectively prohibiting your neighbors, friends, and family from installing your OS on their machines. Not that you'd ever break the law like that in the first place. (More about XP product activation as October approaches.)

WASTED MONEY, WASTED TIME: XP will arrive about one year after the launch of Windows Millennium—which leads us to ask why the crash-happy ME was ever released in the first place. Now, we don't think Microsoft should delay XP, but we do think it should be more thoughtful with its OS road map.

MP3 ANTAGONISM: Bundled directly into XP, Windows Media Player 8 lets you encode files in Microsoft's WMA format at high bit rates. But if you try to encode an MP3 with this software, you'll be locked down at a dismal 56Kbps. This disturbs us. If big, bad, selfish Microsoft can't defy the recording industry, then what company can?

FANTASY HARDWARE REQUIREMENTS: It's not a sin for software to demand powerful hardware, but there's something inherently wrong in letting people think that XP will run on a machine with a 300MHz processor and 64MB of RAM.

Countdown to Armageddon?

Nothing clears out the *Maximum PC* editorial bullpen faster than the arrival of an unmarked package that contains a clock counting backwards.

But once our nerves settled down, we picked up the silver clock and realized it wasn't a present from the Unabomber, but rather a clock sent by Microsoft to mark the October 25 release date of WindowsXP.

This silver tchotchke was set to 163 days when we received it, and, like an ominous prop from the movie *Fail-Safe*, it counts down the days, hours, and minutes to the release of WindowsXP.

If past is prologue, many will be surprised if Microsoft hits its target. Windows 95 came out so late in 1995, it really should have been called Windows 96. Windows 2000 did launch in early 2000, but everyone expected the OS code to appear in 1999, its eventual name notwithstanding.

How embarrassing would it be for Microsoft to delay XP past Oct. 25? Would the clock count down to zero and then start counting forward with a negative sign? For that matter, can the clock be reset remotely by Microsoft in the event that the release date slips? We'll let you know in October.

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WHAT'S IN A NAME?

AMD Counts to 4

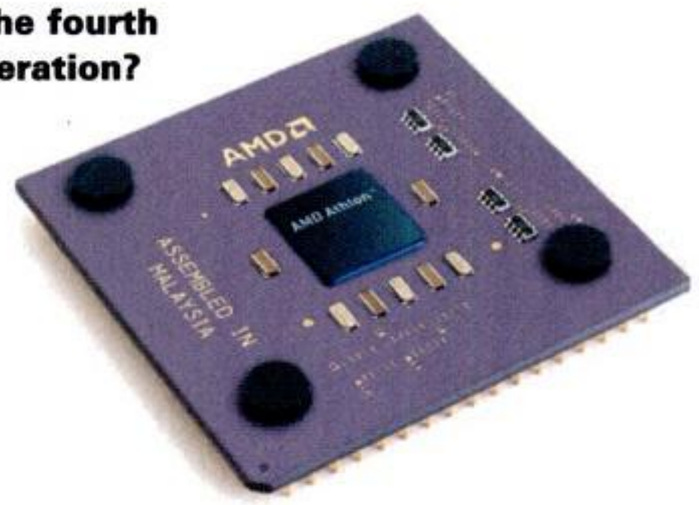
IF YOU'VE ALREADY READ Tom Halfhill's column over on the right, you know that AMD's new mobile Athlon 4 adds new instructions and runs cooler and faster than all previous Athlons. But do you know why AMD picked the name Athlon 4? We're not so sure ourselves.

AMD's marketing machine says the name refers to the fourth iteration of the Athlon processor. But close observers of the company's CPUs are wondering if AMD is having trouble counting its numbers. Let's take a look at the Athlon lineage:

First there was the classic Athlon with 512KB of closely-coupled L2 cache. This processor was based on a 0.25-micron process. Next came the Thunderbird Athlon with 256KB of on-die L2 cache on a 0.18-micron process. The newest Athlon—Athlon 4—also has 256KB of L2 on a 0.18-micron process, but includes the new 3DNow Professional instructions (SSE support by any other name).

So where's the missing third Athlon? AMD says that in between the Classic and Thunderbird Athlons, there was an iteration called K75—essentially a classic Athlon on a more petite 0.18-micron process. So this would signal the second generation of Athlon, making the Thunderbird the third generation.

The fourth iteration?



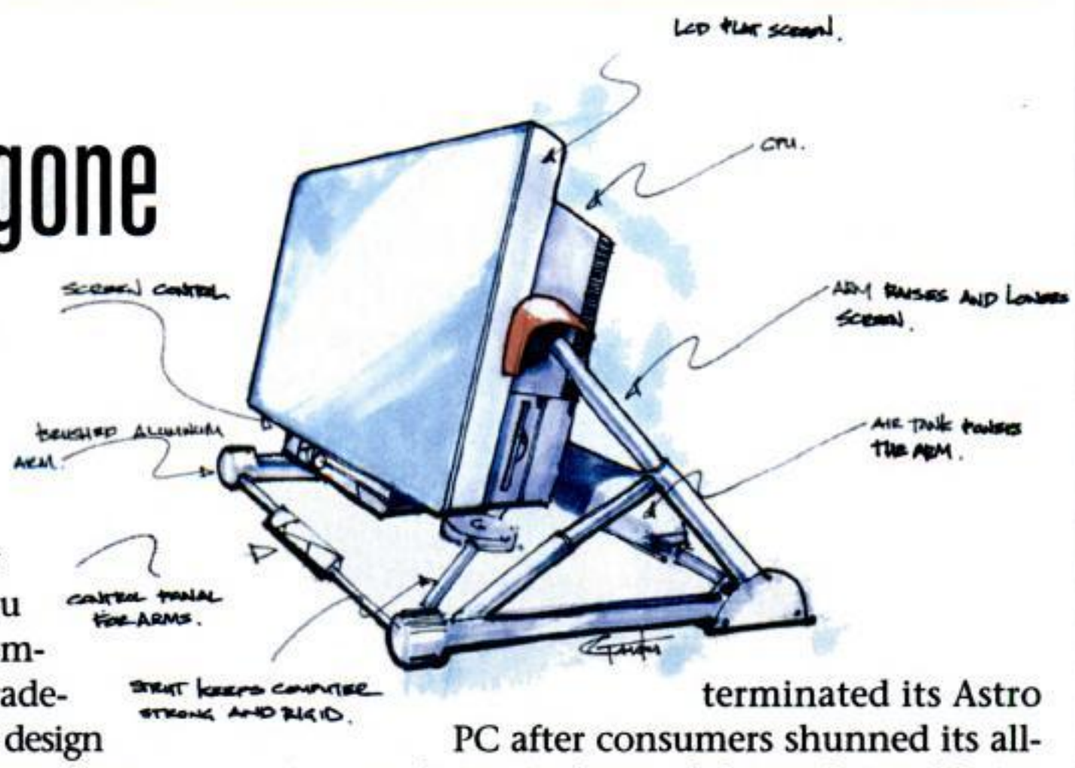
Cynical observers say that AMD's explanation is bogus and that the company just wants consumers to feel that the latest Athlon is on par with Intel's Pentium 4.

Bert McComas, principal analyst at market research firm InQuest, says the name Athlon 4 may offend hardcore AMD fanatics who feel the Athlon is actually superior to the Pentium 4. The name, however, makes perfect sense if you consider it a response to Intel's marketing hype. After all, Intel has always stated that the Pentium III and Athlon offer similar performance—thus the Pentium 4 has existed on its own unchallenged plateau. Until now.

"AMD has thwarted, or severely undermined, this possible strategy with the one simple action of renaming the processor Athlon 4," McComas says. AMD hasn't committed to using the name Athlon 4 for the desktop version of the next-gen processor, but McComas believes AMD will try to make the desktop CPU sound as powerful as its mobile counterpart.

PC PROTOTYPE

Beige Box Begone



PCS GENERALLY FALL into two categories: the powerful but coyote-ugly beige box, and the stylish but impotent machine-cum-fop.

Enter Gravity Box PC, a vendor that says it's prepared to give you both beauty and brawn. The company claims its rigs will be upgrade-friendly, yet deliver artsy industrial design and chic materials such as aluminum alloys.

"We want plenty of expansion and plenty of room," says the company's president, David Houston. "We're going to make a real PC."

Past PCs that emphasized industrial design almost universally failed. Last year, Dell scrapped its funky-looking, rounded-edge WebPC after dismal sales. And two years ago, Gateway terminated its Astro PC after consumers shunned its all-in-one design in favor of the traditional beige box. Even Apple's highly successful (and highly under-powered) iMac appears to be losing steam.

Houston says the key failure of Dell's WebPC and similar designs was the lack of expansion opportunities. Gravity Box doesn't plan to make that mistake. Expect to see products by the end of the year.

FAST FORWARD

A Tame Palomino

BY TOM R. HALFHILL

AMD's new Athlon 4 and Duron processors offer some genuine improvements over previous Athlon/Duron chips, but unless you're seriously into media processing or mobile computing, you probably won't notice much difference in performance.

The new processors are based on the same Palomino core and are nearly identical. In fact, the only distinguishing feature is that Athlon 4 processors have 256K of L2 cache while new Durons have 64K. Both have 128K of L1 cache.

Image processing is by far the most demanding application that typical users encounter today and will soak up as many clock cycles as a CPU can deliver. Sound editing can tax a system, too, but only if you're running complex digital filters on large CD-quality audio files.

That's why the new Athlon 4 and Duron processors have 52 new instructions that provide full compatibility with Intel's SSE instructions for the first time. The new instructions are most useful for data-intensive media processing. AMD's existing 3DNow instructions were a good start but didn't go far enough, and some programs, such as Adobe *Photoshop*, supported SSE instead of 3DNow.

Don't be fooled by the Athlon 4's name. It's not really a next-generation processor like Intel's Pentium 4. It's more like Athlon 1.1. The processor core is basically the same. Besides the new instructions, another performance enhancement is data prefetching—the CPU preloads some data from memory into the data cache to avoid stalling the execution pipeline. That's useful, especially for data-intensive media processing, but it's not huge.

More significant—especially for notebook PCs—is lower power consumption. By tweaking the chip-fabrication process and on-chip signal paths, AMD says it has slashed power consumption by 20 percent compared to a previous Athlon/Duron at the same clock frequency and voltage.

The new processors also adopt AMD's PowerNow technology, previously seen in the AMD K6-2+ and K6-III+ chips. PowerNow can conserve power by scaling the CPU's clock speed and voltage to match changing software demands. Think of it as dynamic underclocking. It's similar to Transmeta's LongRun and is much more sophisticated than Intel's SpeedStep. AMD claims PowerNow will boost battery life by 30 percent.

Add it all up and the new Athlon 4/Duron processors make good sense for notebook users, as well as desktop users who edit large media files. For most other people, the extra speed and lower power consumption aren't compelling reasons to change horses in midstream.

Tom Halfhill was formerly a senior editor for Byte magazine and an analyst for Microprocessor Report. He is now a technical writer/analyst in Silicon Valley.

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HACK, SOLDER, PAINT

Rig of the Month

Ben "Node" Martin, a reviewer for www.virtualhideout.net, wins this month's accolades for a modified case that's simultaneously striking, simple, and meticulously detailed. Internal neon lighting has hit the case-mod world in a big, big way, but too many hardware hackers embellish this aesthetically risky effect with wacky paint jobs. Not old Ben. We utterly dig the interplay between his phosphorescent porthole and flat paint scheme. We also like the way his luminescent lighting slices through the slats of his front bezel. Here's how Ben hacked the mods, in his own words:

"This case was originally an Antec SX1030B before I got to it. I started off by changing the Power and HDD LEDs to SuperBright Blue LEDs, then I cut out a window hole on the right door, and attached a piece of Plexiglas. I found that the handles on the HDD cages stuck out too far, and I couldn't close the door with my new window in place, so I used a Dremel to grind down the ends of the cage handles until they would allow the door to fit.

"My next mod was adding neon. My first neon was a Blue Lightning Rod from **www.streetglow.com**. This was nice, but too weak to light up my case properly. My current neon is a Cold Cathode Neon from www. pcmods.com. It's smaller, brighter, and far superior to my Lightning Rod. My other mods consist of electroluminescent cabling, which I cut to size and put in the grill lines in the front of my case, using silicone caulking. I also have a window applique, which is the sparkly Virtual Hideout sticker that I stuck to the inside of my case window. It makes the window look laser-engraved without the higher cost."

Ben also made nice use of chrome trim—and of course his rig is packed with kick-ass power parts.

If you have a contender for Rig of the Month, e-mail input@maximumpc.com—we'd especially like to see insane cooling contraptions, so get cracking!

July's runners-up (left to right): cases from Christopher J. Roberts, Gene "Bustercaps" Shaw, and James Polles.

GAME THEORY

No, Friends, We're Not Talking About Whales

BY THOMAS L. MCDONALD

So I spent this morning catching sperm. Keep your masturbatory thoughts to yourself. This was all in the line of duty. At **www.fileplanet.com**, I found a side-scrolling action game called *Stop the Sperm*. This little ditty, a mere 4MB download, is from the Swiss Stop AIDS Campaign, which goes to show what socialists do with tax revenue. Little monocular sperm and nasty viruses swim across the screen as you fire condoms to catch them. As the only game I know of to take place inside a vagina, it's a mandatory download.

■ So, tried playing *Tribes 2* on a Voodoo card yet? Please excuse me while I say: Bwa-ha-ha-ha! As *T2* proves, the future belongs to the power of nVidia. By now you've read all about the GeForce3 and its programmable pixel and vertex shaders. You want it. NOW!!! The good news is that reported GeForce3 prices were highly inflated, and the card should street somewhere in the $400 range. Since the true power of the card won't be tapped until DirectX 8 games start shipping later this year—when the price will probably have dropped further—all of you drooling early adopters should sit tight and wait. That is, unless you don't have any GeForce at all. If that's the case, try out the GeForce2 Ultra, which is cheaper and very powerful in non-DirectX 8 games.

■ I guess I should take a moment to comment on *Myst III* in the same sneering, elitist way game writers (myself included) dissed the original and the sequel. But the space where I should have a pithy comment is filled with soul-numbing indifference. Pretty pictures. Nice atmosphere. Lots of clicking. If that's your bag and you just can't handle the in-your-face intensity of, say, *Chessmaster*, then have at it.

■ Eagerly waiting for *Sigma: The Adventures of Rex Chance*, from *Homeworld* creator Relic. It's essentially an RTS game in which you battle with genetically manipulated mutant critters. Beautiful, weird, and innovative, it's one to watch. I'd also like to see a showdown between *Silent Hunter II* and *Destroyer Commander*. I've watched these products evolve over several years, and either one alone would demand a serious chunk of my time—if they end up as good as I anticipate. But the prospect of linking the two separate games in online play—subs against destroyers—has me tingling in all my special places.

Tom McDonald has been covering games for countless magazines and newspapers for 11 years. He lives in the New Jersey Pine Barrens.

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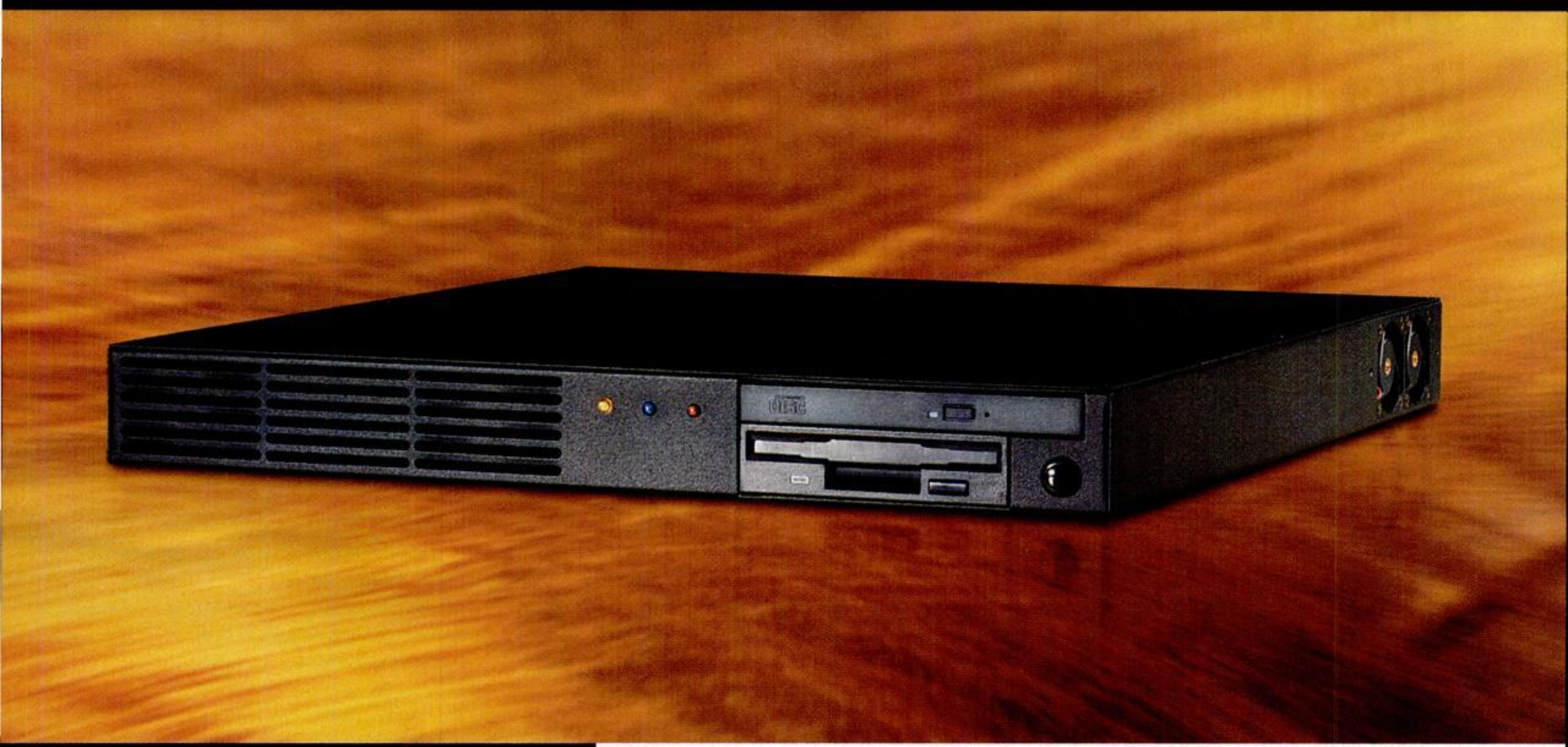

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The versatile SleekLine 1000 sits unobtrusively under your monitor or —with its optional bracket—mounts inconspicuously to the bottom of your desktop. It's transportable enough for sales presentations on the road or travel between home and office.

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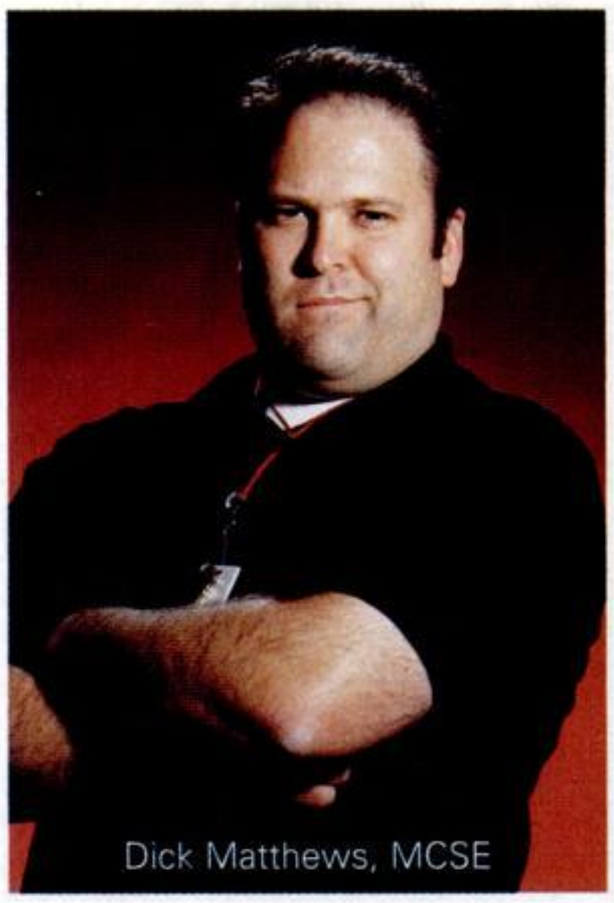
HELPFUL HINTS

Windows Tips for Utter Morons

This month: Coping with a 1600x1200 display


Dick Matthews, MCSE

Howdy-do, jackass. In recognition of your stellar performance during last month's training session, I've decided to upgrade your Windows-awareness rating from "moron" to "utter moron." Thus the new title of this column. So, now, when Mommy and Daddy ask what happened at work today, you can say, "Mr. Matthews gave me a gold star for being dumber than a book of matches!" And then you can go drink a bucketful of slime because you're stupid and annoying and uglier than a shovel.

Anyhoo, let's attempt to fine-tune your screen resolution—just so I can tell my boss that we tried. For starters, running any resolution smaller than 1280x1024 on a 19- or 21-inch monitor is unacceptable. If your monitor *can* run high resolutions, you *should* run high resolutions. And this typically means 1600x1200. All of your deviant newsgroup porn will look sharper, and, of course, your idiotic word processing text will look crisper (though, unfortunately, no more relevant to the dreams and desires of intelligent human beings).

Now, I won't embarrass you by telling you how to increase your monitor resolution—I've kicked your ass around that block many times before—but I will tell you how to make a global adjustment to the size of your fonts and windows, so they don't look unbearably small when running on a 1600x1200 desktop.

Go to Display Properties>Settings>Advanced. A new screen will pop up. Hit the General tab, and pick Other under the Font Size window shade. A Custom Font Size menu will appear. Pick 125 percent, or define your own percentage increase.

Because this trick affects not only your desktop interface but also the fonts and windows in all your applications, everything will appear large enough to please your weak, little ferret eyes. Sure, some of the seedier web sites will render fonts extremely small (thanks to hack site designers who define font sizes in pixels), but you shouldn't be surfing porn sites at work anyhow, so you better stop now or I'll rat you out to Old Man Jenson.

Excuse me? Yeah, that's right. I didn't think so.

FUN-SIZE NEWS

nVidia Preps Athlon Chipset

Graphics giant nVidia is expected to release a new integrated chipset for AMD's Athlon. The new chipset will employ technology found in Microsoft's Xbox along with AMD's HyperTransport technology, which speeds up communication among motherboard-bound devices. The media-savvy chipset will also encode/decode Dolby Digital audio and offer GeForce2-level graphics.

Honey, I Shrunk the CPU

Intel expects to have its 0.13-micron shrink of the Pentium III released by this summer at speeds from 866MHz to 1.13GHz. Codenamed Tualatin, the tiny P-III is expected to have as much as 512KB of on-die cache. Don't look for Tualatin on desktops, however. Intel will likely push all of its first batch to notebook vendors.

New Sony PC Watches TV

A new Sony PC is slated to include TiVo-like TV-recording functions. The PCV-RX490TV will come with a 1.7GHz Pentium 4, an 80GB hard drive, a TV tuner, and a DVD-R drive. The inclusion of Pioneer's DVD-R drive is sure to raise eyebrows at Sony corporate, which is pushing its own DVD+RW spec over DVD-R.

Xbox Primed for November

Quelling rumors that Xbox could be delayed until next year, Microsoft says it will unleash Xbox in November and plans to have from 600,000 to 800,000 units ready to sell on launch day. Price for the überconsole is $300, and 20 titles will be available on Sony's day of reckoning.

Phone Home in Style

FORGET MICROBROWSERS and the pathetic stamp-size screen on your WAP-enabled cell phone. AT&T has introduced new public pay phones that offer high-speed Internet access. Running Windows NT and a Pentium III, the Pay Phone 2000I features a 12-inch touch-sensitive screen, a full-size keyboard, Ethernet, and an infrared port that will eventually let you hook up your Palm or Pocket PC.

The phones accept cash or credit cards. Cost is 25 cents per minute with a four-minute minimum. AT&T has already experimented with offering data ports on pay phones, but Pay Phone 2000I is the company's first pay phone with a browser and broadband connectivity.

Currently, the phones are only installed in the Dallas-Fort Worth, Atlanta-Hartsfield, and JFK/New York airports. But those in the know believe that net access will one day be in all payphones.

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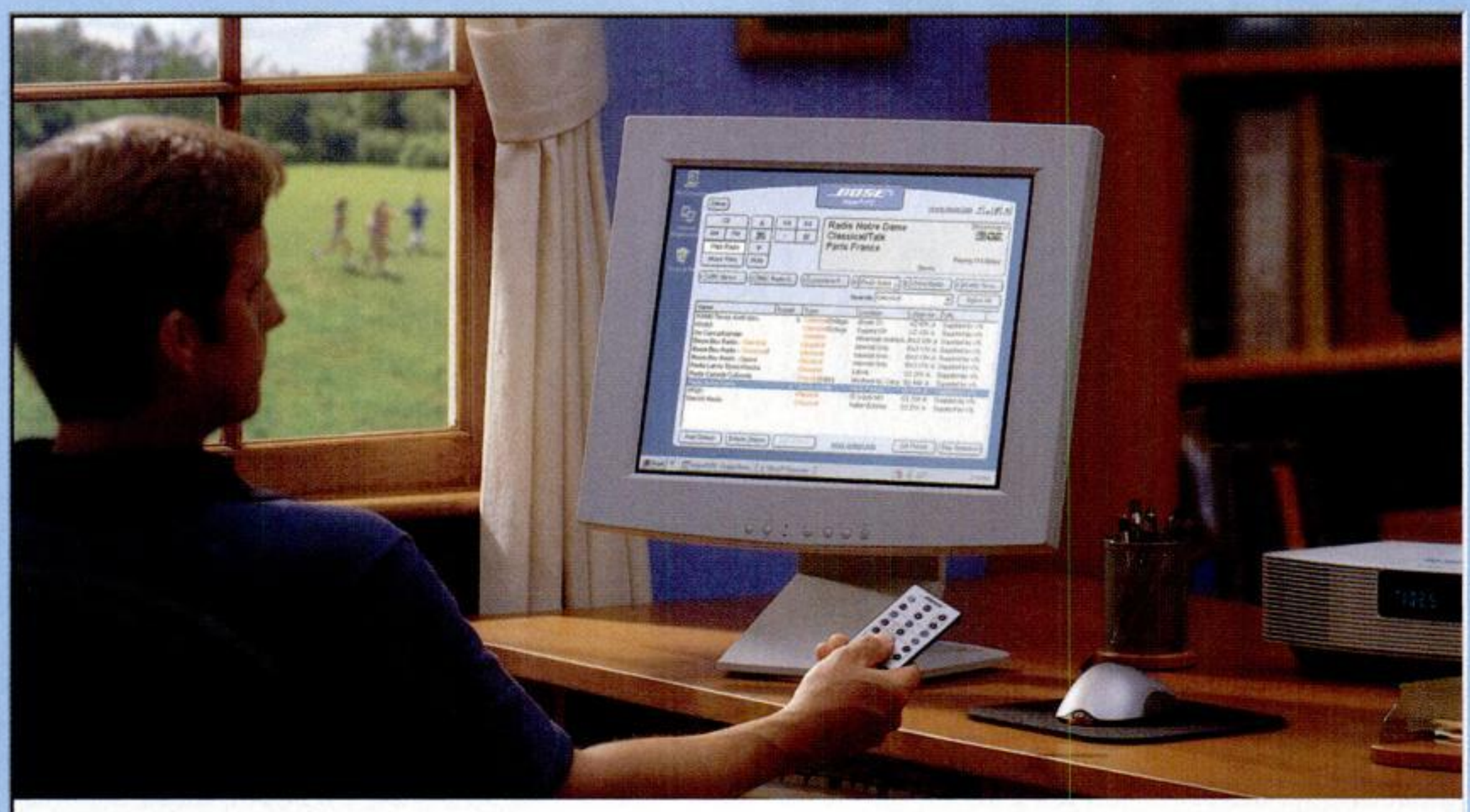

Accesses Internet radio, MP3s and stored CDs so easily, you won't need help from your kids.

Introducing the Wave/PC™ system. A revolutionary new product from Bose®.

You don't have to be young to make the most of your PC's musical capabilities. Because now there's the Wave/PC™ system. It doesn't matter if you're 7 or 70, the Wave/PC™ makes it easy for you to go from Web radio to MP3s to stored CDs at the touch of a button.

Access thousands of Net-streamed radio stations.

You can listen to Web radio stations from around the world with the Wave/PC™ system. Its search feature lets you find the music you want quickly and easily. You can also download MP3 files through the Web and store them on your hard drive for later playback.

System Includes:
Software
Audio Unit
Remote Control

Store and organize your CDs on your PC.

Record your CDs on your hard drive, so all your music is easy to access. Never suffer through those songs on a CD you don't want to listen to again. The Wave/PC™ system lets you select your favorite songs and then file them on your PC. You can even make compilations of your favorite songs from different CDs.

It's as easy as using the remote.

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Head2Head

A showdown among natural PC competitors

THIS MONTH: Budget Videocards

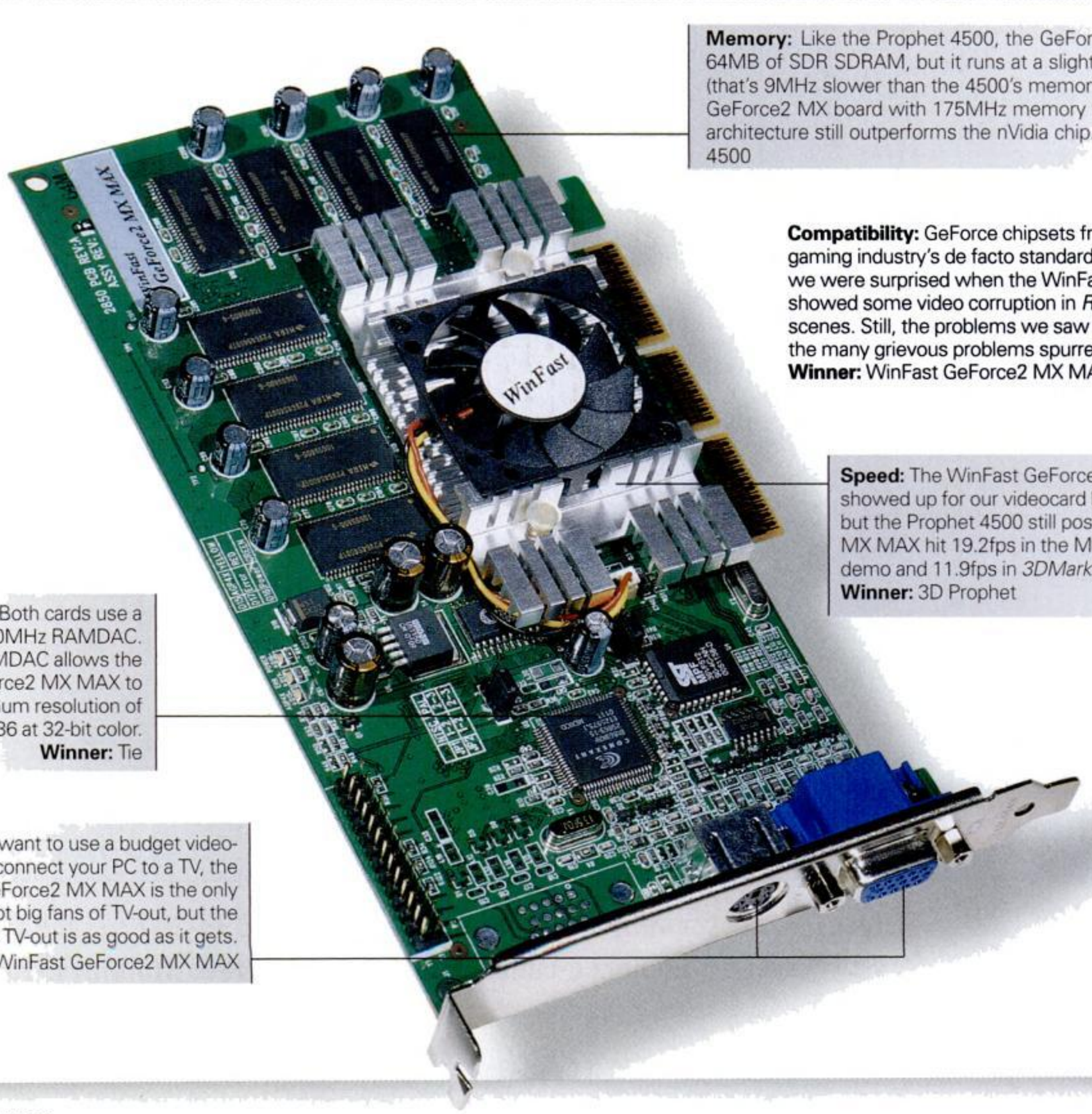
For the cost-conscious consumer who can't afford a GeForce3, there have been essentially just two videocard technology choices: the industry-standard nVidia GeForce2 MX chipset (available in cards from several different vendors) and the ATI Radeon VE chipset (available in cards from ATI). But now there's a new 3D chipset in town—the Kyro II from ST Microelectronics (represented here by the Hercules 3D Prophet 4500). We decided to see if it can beat the GeForce2 MX juggernaut.

The Kyro II uses the same tiling architecture that the Sega Dreamcast game console employs. By determining which surfaces need to be visible *before* they're drawn by the accelerator, the Kyro II breaks a scene up into separate tiles and only renders the visible ones. This approach differs from that of traditional 3D accelerators, which waste rendering power by drawing surfaces occluded by other areas.

The catch is that most games aren't written with the tiling architecture in mind, and earlier 3D accelerators based on this technology had compatibility issues. With that in mind, we tested each card with a motley assortment of games past and present: *Serious Sam*, *Black & White*, *Tribes 2*, *Quake*, *Quake III Arena*, *Railroad Tycoon II*, *SimCoaster*, and *EverQuest*. May the best budget card win!

—WILL SMITH

LEADTEK WINFAST GEFORCE2 MX MAX



Memory: Like the Prophet 4500, the GeForce2 MX MAX includes 64MB of SDR SDRAM, but it runs at a slightly slower 166MHz (that's 9MHz slower than the 4500's memory). We'd like to see a GeForce2 MX board with 175MHz memory to see if the Kyro's tiling architecture still outperforms the nVidia chip. **Winner:** 3D Prophet 4500

Compatibility: GeForce chipsets from nVidia are the PC gaming industry's de facto standard for compatibility, so we were surprised when the WinFast GeForce2 MX MAX showed some video corruption in *Railroad Tycoon II*'s cut scenes. Still, the problems we saw weren't as serious as the many grievous problems spurred by the Prophet 4500. **Winner:** WinFast GeForce2 MX MAX

Speed: The WinFast GeForce2 MX MAX definitely showed up for our videocard benchmark session, but the Prophet 4500 still posted better scores. The MX MAX hit 19.2fps in the MaximumPC *Quake III* demo and 11.9fps in *3DMark2001* Game 2. **Winner:** 3D Prophet

RAMDAC: Both cards use a super-fast 350MHz RAMDAC. This RAMDAC allows the WinFast GeForce2 MX MAX to run a maximum resolution of 2048x1536 at 32-bit color. **Winner:** Tie

Outputs: If you want to use a budget videocard to connect your PC to a TV, the WinFast GeForce2 MX MAX is the only choice. We're not big fans of TV-out, but the WinFast's TV-out is as good as it gets. **Winner:** WinFast GeForce2 MX MAX

MAXIMUMPC VERDICT

WinFast GeForce2 MX Max LEADTEK

+ WHAT WE LIKE

As the de facto standard in the gaming industry, it's compatible with almost every game we tested and faster than the original GeForce2 MX.

– WHAT WE HATE

Despite an impressive pedigree, it performs slower than the Prophet 4500.

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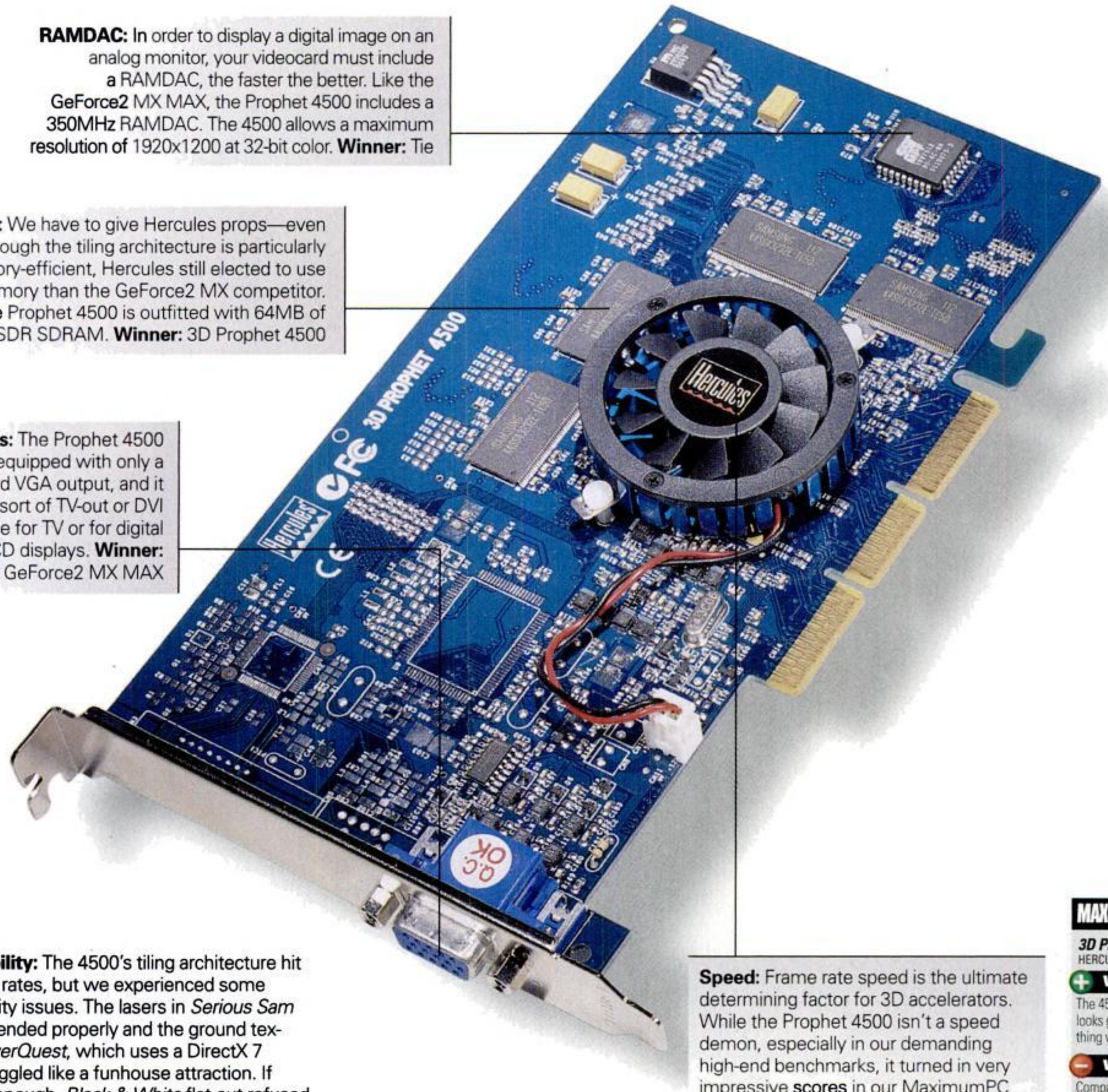
HERCULES 3D PROPHET 4500

RAMDAC: In order to display a digital image on an analog monitor, your videocard must include a RAMDAC, the faster the better. Like the GeForce2 MX MAX, the Prophet 4500 includes a 350MHz RAMDAC. The 4500 allows a maximum resolution of 1920x1200 at 32-bit color. **Winner:** Tie

Memory: We have to give Hercules props—even though the tiling architecture is particularly memory-efficient, Hercules still elected to use faster memory than the GeForce2 MX competitor. The Prophet 4500 is outfitted with 64MB of 175MHz SDR SDRAM. **Winner:** 3D Prophet 4500

Outputs: The Prophet 4500 comes equipped with only a standard VGA output, and it lacks any sort of TV-out or DVI interface for TV or for digital LCD displays. **Winner:** WinFast GeForce2 MX MAX



Compatibility: The 4500's tiling architecture hit fast frame rates, but we experienced some compatibility issues. The lasers in *Serious Sam* weren't blended properly and the ground textures in *EverQuest*, which uses a DirectX 7 engine, wiggled like a funhouse attraction. If that's not enough, *Black & White* flat-out refused to run. *All* new accelerators should run current A-list titles such as *Black & White*.
Winner: WinFast GeForce2 MX MAX

Speed: Frame rate speed is the ultimate determining factor for 3D accelerators. While the Prophet 4500 isn't a speed demon, especially in our demanding high-end benchmarks, it turned in very impressive scores in our MaximumPC *Quake III* demo (27.1fps) and in the *3DMark2001* Game 2 benchmark (12.4fps). **Winner:** 3D Prophet 4500

MAXIMUMPC VERDICT

3D Prophet 3500
HERCULES

+ WHAT WE LIKE

The 4500 is damn fast, and looks great… when everything works.

– WHAT WE HATE

Compatibility has always been a problem with earlier PowerVR, and the 4500 was no exception. 3D incompatibilities are *sooo* 1996.

PHONE **877.484.5536**
www.hercules.com
$150

6

THE UPSHOT

Although the 3D Prophet 4500 turned in better frame rate performance, we're reluctant to recommend any videocard based on the Kyro II chipset. We remember earlier iterations of the chipset (then called PowerVR) that left hapless users unable to play new releases for months. Mindful of this—as well as the problems with *Black & White* and other current titles—we can't recommend the Prophet 4500 (for now). No matter how fast a card performs in *Quake III Arena*, if it doesn't work with the other games you buy, you might as well use an old S3 Virge. By contrast, every game released today gets qualified for GeForce-based hardware, virtually guaranteeing that you won't have compatibility problems.

Because it's shaken up the budget videocard landscape, the 3D Prophet 4500 will have a place in the Lab during the next few months. We'll test it with updated drivers and in the latest 3D games. Despite compatibility issues, we're not ready to completely write off the Prophet 4500's great performance. Stay tuned.

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WatchDog

Maximum PC takes a bite out of bad gear

Got a bone to pick with a vendor? Been spiked by a fly-by-night operation? Sic The Dog on them by writing **watchdog@maximumpc.com**. The Dog promises to get to as many letters as possible, but only has four paws to work with.

Iomega to Settle "Click of Death" Suit

Iomega has agreed to settle a protracted class-action suit that alleges Iomega Zip drives contain a design defect that kills both the drives and its data disks.

If approved by the New Castle County Superior Court in Delaware, the settlement will have Iomega issuing rebates to Zip owners and donating $1 million in hardware and software to school systems. Everyone who purchased a Zip drive between January 1, 1995, and March 19, 2001, is included in the settlement.

The Dog reported on Iomega's infamous "click of death" as far back as March 1999. The syndrome occurs when a drive's read head falls out of alignment and struggles to find the disk's first track of data. Misaligned drives are not only worthless, they also can destroy inserted disks and all the data on the disks. Grieving Zip owners call the problem the "click of death" because of the loud clicking that occurs when the misaligned head struggles to find its footing.

Confusion and anger have beset Zip owners because many are unable to tell the difference between the "click of death" sound and the normal clicking and whirring that occurs when mounting a Zip disk. Attorneys in the case believe some 24 to 28 million Zip drives were sold during the period covered by the suit. Attorneys filed the suit in Delaware, accusing Iomega of violating the Delaware Consumer Fraud Act. Under terms of the proposed settlement, Iomega does not admit that a defect actually existed.

While it sounds like justice may finally prevail, the settlement certainly won't appease everyone. So what do you get for the $150 to $200 you spent on a drive that may one day fail and wipe out your precious data? According to the settlement—which has yet to be approved by the court—you'll walk away with $10 toward the purchase of another Zip 250 drive or $5 toward the purchase of a Zip 100 drive.

Is this a class-action settlement or a marketing plan by Iomega to sell more Zip drives? It's difficult to tell: Iomega will give you a larger rebate if you purchase more Iomega hardware along with the drive. Even worse, under the terms of the settlement, Iomega would be absolved of any liability for lost data.

It's important to note that not all of the 24 million Zip drives on the market will fail. In fact, a vast majority of consumers have never had problems with Zip drives. To address any jitters consumers may have about their drives, Iomega is offering special technical support at 800.697.8833.

Compared to similar class-action suits, the pending Iomega settlement sucks. Toshiba agreed to shell out $2.1 billion for a floppy disk problem. A Kenwood settlement replaced funkified 40x40 drives with 72x drives. And a Philips settlement awarded consumers newer—albeit refurbished—drives to replace its doodie-bad CD-RW drives.

The court is expected to rule on the Iomega settlement this summer. The Dog will update you on the decision here. Meanwhile, if you think you'd rather just sign up now for the rebate, visit www.iomega.com/rinaldi/index.html. Woof.

"Is this a class-action settlement or a marketing plan by Iomega to sell more Zip drives? It's difficult to tell: Iomega will give you a larger rebate if you purchase more Iomega hardware along with the drive."

Intense Bankruptcy

DEAR DOG: I've been having a hell of a time trying to find anything useful on Imeron/BSG Labs, the makers of the Intensor chairs that have speakers built into them. I've got one of the full-fledged chairs (the 350 series) and need to find out how to perform some maintenance on it. There's nothing at the company's web site and I'm having no luck finding anything else. So, if you know if Imeron's MIA or KIA, please let me know so I can just give up on the stupid thing and get something comfortable. The hard part is finding another chair that folds down so I can roll it under my desk.

—Justin

THE DOG RESPONDS: Alas Justin, your ass will rumble no more. Imeron, a.k.a. BSG Labs, filed for Chapter 7 liquidation in May of last year. What did in Intensor? We're not entirely sure, but we suspect Intensor's reputation for having lame sound output in their gaming chairs may have contributed. After all, how many people have ears in their groins? For what it's worth, the chairs did make it to the mainstream and were at one point sold at Costco stores. If you're looking for an alternative to the Intensor, check out Battlechair.com.

INTENSOR 350 CHAIR

Keys to the Magic Kingdom

DEAR DOG: I purchased a gaming computer from CyberPower, Inc. in Baldwin Park, Calif., about a month ago. I was thoroughly happy with my 850MHz Athlon Gamer Extreme until I had to perform a reinstall. CyberPower does what many computer manufacturers do and gives customers a restore CD. This I can live with. However, what really troubles me is that the company did not provide me with a product key for Windows!

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Consumer Advocate

Common sense told me the product key would be found on the side of my computer case. No such luck. The Windows key number had been removed from the side of the case and all that is left is the sticky residue from the sticker!

I called CyberPower and asked for a product key for my computer to reinstall Windows 98. When two different individuals gave me different numbers that were both invalid, I nearly gave up hope. After waiting an additional three days with no help from CyberPower and no offer of a real Windows CD with a valid key, I went out and bought a copy of Windows Millennium. I waited another two days, and CyberPower still refuses to return my phone calls.

Am I being unreasonable to ask for a computer that I paid for with Windows to actually have a valid Windows license? I think CyberPower should give me a credit toward the $170 I paid for the full version of Windows Millennium. I would have purchased the update had I had a valid Windows CD and key.

—Dave Clark

"I think CyberPower should give me a credit toward the $170 I paid for the full version of Windows Millennium."

THE DOG RESPONDS: The Dog contacted Eddie Vong, a manager at CyberPower, who defends the company's handling of the case. Vong disputes Clark's claim that no Certificate of Authenticity was provided, and says that as part of the standard OEM build, the consumer—not the vendor—must enter the product key to start Windows. Ultimately, Vong says, it is the responsibility of the customer to keep a copy of the product key available.

CyberPower is unable to provide another product key without violating its license with Microsoft—unless it pays for another copy of Windows 98, Vong says. Finally, Vong says that even if the COA was not in place when the system was shipped, CyberPower's warranty information clearly states that customers must report missing components within seven days of receiving it. "We did our best to try to find the number for him, but he failed to report it within seven days and there's nothing we can do for him," Vong says.

Vong is correct—CyberPower's web site does spell out the company's policy. But The Dog feels a seven-day period is a bit severe. The local Better Business Bureau concurs: "We advise careful evaluation of (CyberPower's) technical assistance, servicing, and refund and exchange policies prior to ordering products." The BBB did note that CyberPower is a member of the BBB and has responded to all complaints by issuing RMAs, refunds, or offers of additional assistance.

Ultimately, the lesson every PC user should learn is that he or she should keep a good record of the product key. If you've already lost your product key for Windows 95, 98, or Millennium, you can find it by starting Regedit and browsing to \HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion. You should be able to find your product key listed there.

Another Scorcher!

Dell has recalled more than 284,000 notebook computer batteries that could spark fires. The batteries can overcharge, get very hot, release smoke, and go up in flames, Dell says. The batteries were used in Dell Inspiron 5000 and Inspiron 5000e notebooks sold between January 7, 2000, and March 21, 2001. The batteries should carry the markings "Dell" and "Inspiron 5000 Battery Module." Look on the battery for a label that says "Cell Made in Japan." Above the words "Made in Japan" are codes that identify the year, week, and manufacturer. If the code *doesn't* end with the letter P, the battery is *not* defective. If it does have a P and the first set of numbers is 99, the battery is defective. If it has a P and the first set of numbers is 00 and the second set of numbers is 51 or below, the battery is part of the recall. All other batteries are safe.

The company is asking consumers to remove the batteries from notebooks before contacting Dell. Consumers who have bad batteries will immediately receive one replacement battery; a second battery will be shipped to the customer after the defective battery is received by Dell. Dell is also providing a BIOS update for affected machines. More information on the recall is available at **http://support.dell.com/i5000battery** or by calling 877.237.3355. ■

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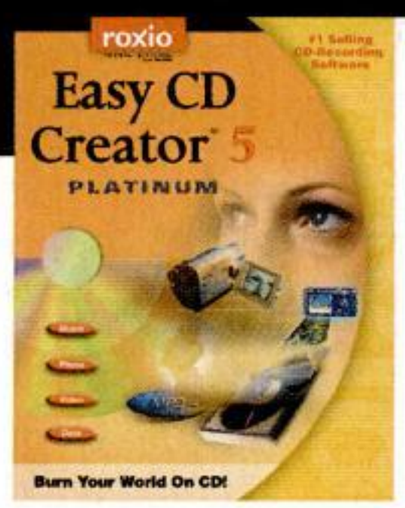

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D·I·G·I·T·A·L DARK

Forget the film and trips to the Fotomat—with the right equipment, you can capture, edit, and share high-quality images on your own. We show you how.

FIND THE RIGHT CAMERA
PAGE 27

ANATOMY OF A DIGITAL CAMERA
PAGE 28

IN THE DARK-ROOM
PAGE 30

PICK A PRETTY PRINTER
PAGE 32

If you're a long-time devotee of silver-halide photography, you've probably eyed digital-imaging technology suspiciously—and you should have, given the relatively low level of quality that digital cameras have traditionally delivered. But if you haven't recently revisited or considered in the first place—all that digital imaging has to offer, you're missing out. Quality continues to increase while prices continue to drop, and setting yourself up with the camera, software, and printer that make up a digital darkroom can easily pay off in terms of convenience and control. And if you're new to photography altogether, harnessing the power of your PC can make for an easier—and ultimately more powerful—entry into the realm of imaging.

It doesn't matter whether you've ever spent time in the darkroom and emerged reeking of fixer; shooting digitally gives you an enormous amount of control over the appearance of your images, and the results you want will probably come faster and more easily than they would in a conventional darkroom.

YOU CAN TAKE IT WITH YOU

Film purists, take note: We are not calling for the death of film photography (though its eventual commercial demise does seem to be looming). In fact, we rather like film photography—and some film-based characteristics, such as grain and the ability to handle low-light situations, are difficult to re-create by digital means. But there are a variety of ways to happily marry traditional film photography skills to digital tools. For starters, any digital camera allows for manual adjustments of aperture, shutter speed, ISO equivalent, and exposure compensation. And if you're still learning the basics of exposure, applications like *Photoshop* can provide you with unparalleled control in correcting your images after you've taken them.

Which digital darkroom options should you spring for? We'll show you what to look for in a digital camera, tell you what features you can expect for what price, and offer a few recommendations. We'll give you a brief tour of some of the more popular image-manipulation tools and tell you how you can use them to quickly touch up any digital image. We'll also offer some photo printer suggestions and some recommendations for finding online photo-sharing sites.

A DEVELOPING MARKET

Digital camera prices are all over the map. You may have seen the $50 models that eager ISPs give away like pens at the bank, or the $30,000-plus units that professional studio photographers use to capture single files in excess of 64MB. The intended use of the camera and the quality of the image output play the biggest part in determining price. Prices also generally increase proportionately to the image resolution, though a number of other special-interest features—long zoom lenses, rapid shooting rates, and unique removable media—could also significantly boost a camera's price.

For our purposes, the consumer camera market can be divided into three categories: low-end (below $300), mid-range ($300–$700), and high-end ($700 and above). If you're hoping to use your existing 35mm lens collection, you'll need to consider a professional-level SLR, which will set you back at least $3,500. For serious photojournalism work, you'll need to invest from $4,500 to $7,500 for an acceptable camera.

If you're shopping for a digital camera, you'll soon find yourself grappling with two basic specs: resolution and storage-media type. Of the two, resolution is far more significant in determining a camera's price and potential uses, but it's helpful to familiarize yourself with the various options available in storage media. And then there are the photographic features: Generally speaking, the more user control you seek, the more you'll need to pay.

RESOLUTION: PIXELS AND PRINTS

While resolution—the number of pixels in the recorded image—isn't necessarily the most significant factor in determining image quality, getting a camera with the right resolution to meet your needs is of the utmost importance. Currently, digital cameras are primarily marketed according to megapixel count—that is, how many millions of pixels they provide in image resolution.

Low-end cameras clock in at one megapixel or less. Those that offer less than a megapixel are often referred to as VGA resolution (640x480 pixels) or Super VGA resolution (800x600 pixels) cameras. Most of these cameras use very inexpensive components—such as a CMOS sensor rather than a CCD (see White Paper in the May 01 issue for an

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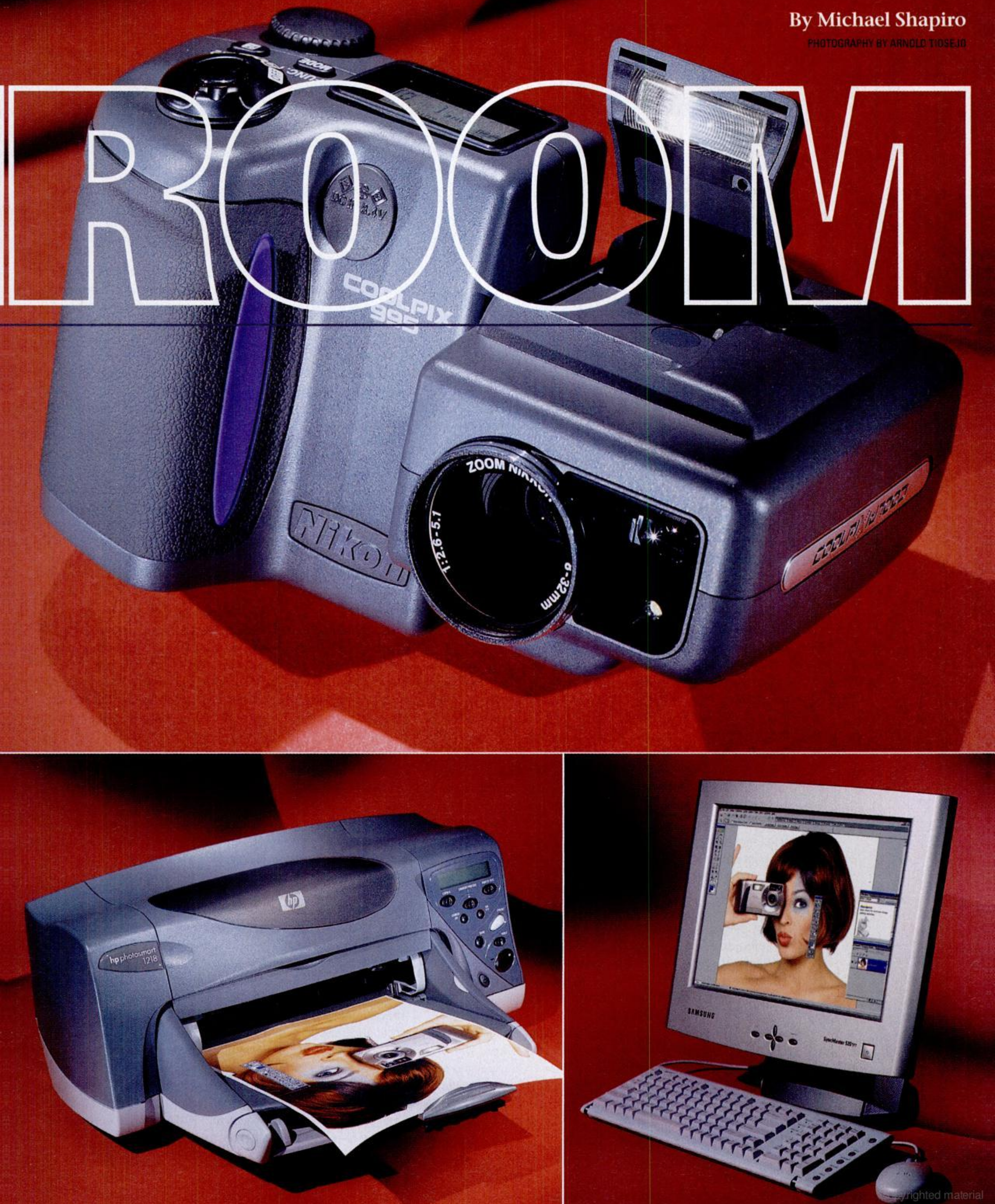
D300 or D2Hs?

By Michael Shapiro

PHOTOGRAPHY BY ARNOLD TIOSEJO



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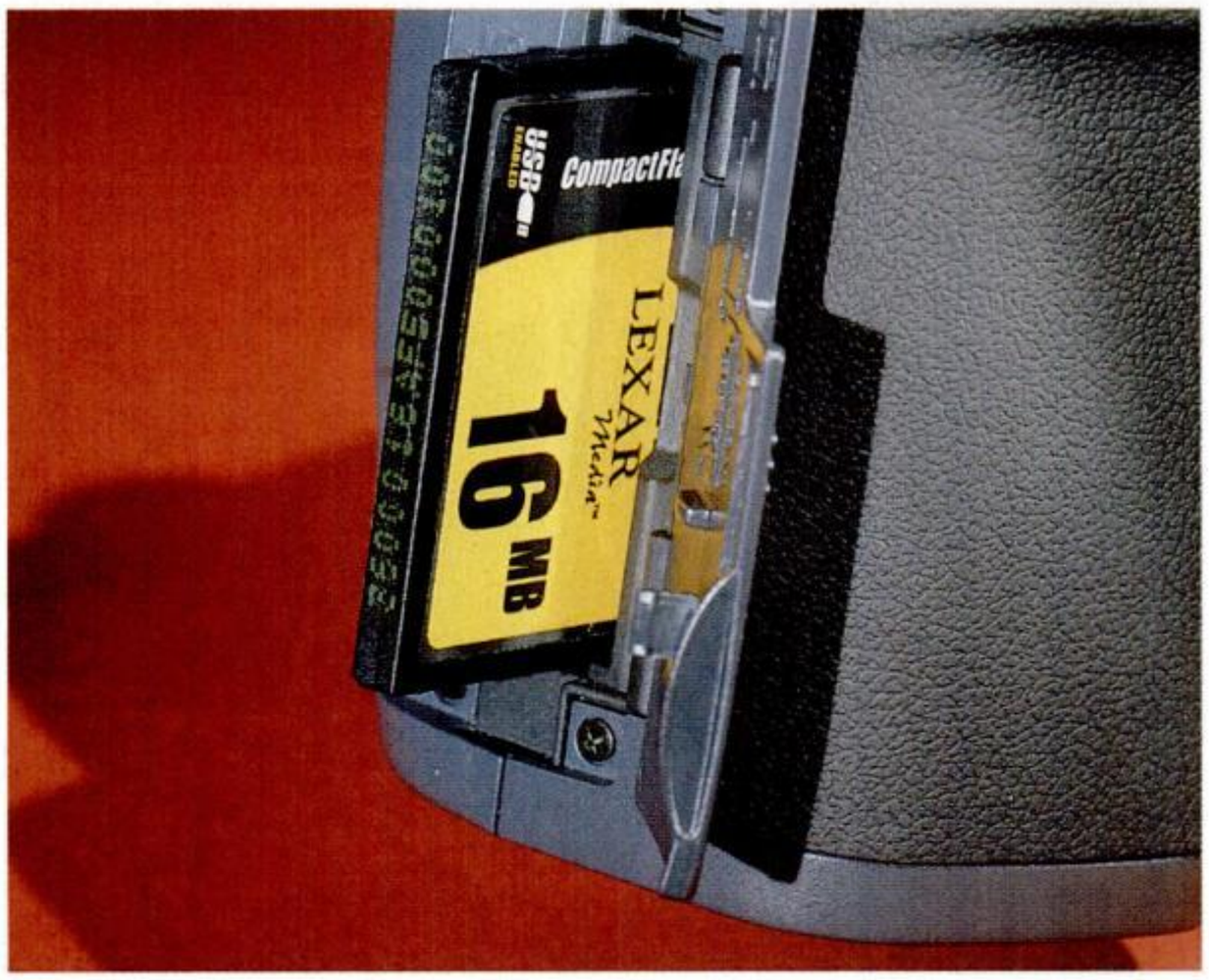

CompactFlash **It's stable, sturdy, and sizeable enough to store digital images with aplomb.**

in-depth explanation of CMOS and CCD technology)—to keep the price down, so the quality of their output suffers. You won't likely get satisfactory prints from a camera of this sort, but the images may be acceptable for web use, which requires just 72dpi output resolution. There's also a host of cameras to choose from that utilize a 1.3-megapixel CCD as an image sensor and range in price from $200 to $300. Depending on the overall quality of the camera and your method of printing, you can get acceptable 5x7-inch prints from these cameras and should be pretty satisfied with the 4x6-inch prints these devices produce.

Coupled with a high-quality photo inkjet printer, a 2-megapixel camera can churn out impressive 8x10-inch prints. Depending on the camera and its features, you can find 2-megapixel models for anywhere between $250 and $1,000. For the most part, the 2-megapixel models mark the mid-range camera category—though, as prices drop, they're gradually creeping into the low end.

Currently representing the high end of the consumer camera continuum are 3-megapixel monsters, most of which use a 3.34-megapixel CCD. Three million pixels make for an impressively smooth image—and since professional-level photo printing requires a resolution of at least 266dpi, these cameras are best suited for creating reasonably sized images that are going to be printed professionally.

REMOVABLE MEDIA: FLASH MEMORY

Digital camera vendors haven't expressed any interest in agreeing on a standard when it comes to removable media, so different cameras use different types of flash memory. Each medium has its benefits, but we recommend choosing a camera that uses one of the more popular, stable formats: CompactFlash or SmartMedia.

We prefer CompactFlash cards for our digital imaging needs, and many camera manufacturers agree—Nikon, Canon, Hewlett-Packard, Agfa, Kodak, and higher-end Olympus models all use CompactFlash, and that's a mere fraction of the cameras that do. The cards are available in sizes up to 512MB, are extremely stable, and are very sturdy. We've frozen 'em, stomped on 'em, and microwaved 'em (all for research purposes, of course), and had nary a problem.

SmartMedia cards are also stable media devices, but their bodies are flimsier. Found in cameras made by Olympus, Fujifilm, Ricoh, and Leica, to name a few, they're more or less trustworthy, but we have had a few file-corruption difficulties with them in the past. And currently, SmartMedia's storage capacity maxes out at 128MB.

FIND YOUR FEATURES

What should you look for when perusing a digital camera's spec sheet? Your intended use for the camera will determine which features to focus on. Following are some common considerations. (We've also provided a map of camera features on pages 28-29.)

Lens quality is of paramount importance. Look for a glass lens of high-quality construction that minimizes distortion. The widest aperture of the lens is often expressed as lens "speed"; this indicates the maximum light that is permitted to reach the image sensor (f/2.8 or lower is common for a high-quality lens).

You'll find the zoom lens as a feature on mid- and high-priced cameras. Pay close attention to the distinction between optical and digital zoom. An optical zoom lens truly has a varying focal length; it generally comes in 2x, 3x, and 4x varieties, though 6x and 10x zooms have recently been introduced. For those accustomed to thinking in terms of 35mm film equipment, the 35mm equivalents of these lengths are usually provided on a camera's box (e.g., a 2x zoom is equivalent to 32–64mm). A digital zoom, on the other hand, is just a function that crops and enlarges your image in-camera. Use this feature sparingly, if at all—you generally get better results by cropping and enlarging the file in an image-editing program. And if a camera's specs claim 6x zoom, read the fine print—that could be the marketing team's math for a 3x optical and 2x digital zoom, used in tandem.

Most lower-priced digitals lack an LCD screen, which means you can't view the images you've shot until you've downloaded them to your computer. A few higher-priced models have good LCD screens but no optical viewfinders, so you're forced to use the battery-draining LCD to compose your photos. If you intend to use both the LCD and the optical viewfinder, be certain they're both available on a given camera.

If you know photography and want the control afforded by features such as aperture-priority, shutter-priority, manual exposure, manual white balance, and a choice of metering modes, you'll find a number of cameras that meet your requirements—but they'll cost you. Manual-everything cameras usually fall in the high end of the market, though a variety of manual options exist in the mid-range. Just be sure everything you'd like to adjust is indeed adjustable.

SYSTEM REQUIREMENTS

Your PC doesn't need to have the fastest, sexiest specs around to serve as a viable digital darkroom, but any shortcomings in the CPU or memory departments will quickly make themselves known. A slow CPU can turn the filter actions of image-editing programs into a seemingly never-ending process. Heavy-duty image-editing apps like Adobe *Photoshop* eat up RAM in short order and seek great expanses of hard-drive space for scratch-disk purposes. And high-resolution images themselves demand a whole lot of real estate—an uncompressed file from a 3-megapixel camera at maximum resolution weighs in at nearly 10MB. The PC that'll be driving your digital darkroom needs to have enough hard-drive space and RAM to make your digital photography experience a pleasurable one.

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FIND THE RIGHT CAMERA

A quick look at our three favorite digi-cams in three different price ranges.

Low End $300 and under

In Focus: Kodak DX3500, $300, www.kodak.com

The flagship camera of Kodak's new EasyShare line, the DX3500 is geared toward the digitally inexperienced. Its auto-everything settings make it amazingly easy to operate, and the bundled software streamlines the process of downloading, cataloging, editing, and e-mailing your images. Best of all, the DX3500's 2.2-megapixel picture quality is far and away the best we've seen for $300.

The DX3500—and, in fact, all the cameras in Kodak's EasyShare line—works in conjunction with the optional Kodak Camera Dock, which automatically recharges the batteries and downloads camera images to a PC when the camera is nestled inside it. The Dock will set you back another $80, but it comes with a rechargeable battery pack that should more or less pay for itself over the long run.

Mid-Range $300 to $700

In Focus: Olympus D-490/D-510, $450, www.olympusamerica.com

When it was released last year, the Olympus D-490 impressed us with top-notch image quality and a solid set of features. The 2.1-megapixel camera features a 3x optical zoom and an excellent pop-up flash with six different settings, including slow-sync with red-eye reduction.

As of press time, the D-490 is being replaced by the D-510, which is slated to deliver the same image quality and features along with a few new tweaks, such as a smaller formfactor and USB AutoConnect technology that will enable your PC to automatically mount the camera when it's plugged into the machine's USB port—no driver installation necessary! (Look for a full review of the D-510 in an upcoming issue. For a more in-depth look at other mid-range digital cameras, see page 64.)

High End $650 to $1000

In Focus: Nikon Coolpix 995, $900, www.nikonusa.com

The follow-up to the justifiably lauded Coolpix 990, the Coolpix 995 features a pop-up flash that goes a long way toward reducing red-eye; an optical zoom up to 4x; an adjustable color saturation levels; and white-balance bracketing for mixed lighting conditions. The 995's 3.34-megapixel resolution is plenty beefy, and, overall, this device sets a new standard in image quality to which we compare all other consumer digital cameras.

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ANATOMY OF A

A walk through the features and functions

A glance at the side of a digital camera's packaging will usually reveal a list of specifications. Which elements can you live without, and which are non-negotiable? Of course, your imaging needs, as well as your level of expertise, will to some degree determine what features your camera must include. But every camera shares certain elements that shouldn't be skimped on. We took a detailed look at the bells and whistles adorning our favorite high-end camera, the Nikon Coolpix 995.

Mode: Some cameras allow you to select shooting modes on the main dial; here you select them using the button/command dial combination. In either case, you have the ability to quickly change modes without scrolling through the main menu on the rear LCD.

DC-in terminal: The ability to use an AC adapter is key for studio work (and handy for running slide shows from your camera or transferring images to your desktop). Digital cameras suck up battery power in short order, so many of the newer models ship with rechargeable NiMH or lithium ion batteries. We highly recommend buying a set of NiMH rechargeables if your camera supports them.

Memory: The flash memory card should be easily accessible, so watch out for cameras that hide the card door on the camera's underbelly (especially if you intend to do any shooting on a tripod). The CompactFlash and SmartMedia formats are the most common forms of media in the digital-camera realm.

Mode/power dial: Setting the mode is a process that varies considerably among cameras. Same goes for something as seemingly simple as powering the camera on and off. Beware of cameras that position the shutter-release and power buttons too close to each other—you might find yourself turning off your camera every time you're about to capture the perfect moment. This power control is on the mode dial, so when turning on the camera you must select Auto or Manual capture, or Playback.

External-flash sync terminal: External flash capabilities are usually found on higher-end models and may take the form of hot shoes, PC sync terminals, or proprietary flash sync terminals. The power and adjustability of an external flash is essential for many professional photo jobs, as onboard flashes are typically too weak to do much more than fill in shadows or light casual snapshots.

Flash: The more distance you can get between the flash and the lens, the less chance you'll have of producing red-eyed subjects. Pop-up onboard flashes are often a good solution—with the added benefit that if you don't pop 'em up, you don't have to worry about firing them unintentionally. Common (and desirable) flash settings include auto, red-eye reduction, forced fill, forced off, and slow sync.

Lens: Camera lenses can be highly precise optics consisting of a complex construction of glass elements, or they can be rather simple, made of lightweight pieces of plastic. While both serve their purpose, a good glass lens will do wonders for the clarity of your image. Digital neophytes might be unfamiliar with typical digital focal lengths (such as 8–32mm), so the 35mm equivalents are generally mentioned in the specs (in this case, 38–152mm). Threads around the lens indicate the availability of adapters and lens attachments.

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DIGITAL CAMERA

you might see while shopping for your digi-cam.

Optical viewfinder (with diopter adjustment): Look for a clear, bright optical viewfinder, because you'll want to use one when your battery power is low or when shooting in bright sunlight makes your LCD difficult to see. Diopter adjustment is useful for people with corrective lenses. To help eliminate parallax error (in other words, the difference between what you see in the viewfinder and what the camera's lens actually shoots), some higher-end cameras employ electronic viewfinders, which are essentially small LCD screens.

Size/formfactor: Digital cameras are growing ever smaller, but do you want a gadget or a camera? Photographers will likely be most comfortable shooting with a device that's more horizontal than vertical in shape and that's large enough to allow the most important buttons to stand out—and keep you from inadvertently sticking your fingers in front of the lens or flash.

Display: An informative LCD panel display is crucial if your camera gives you the option of manually adjusting a lot of settings—after all, you'll need to keep track of the adjustments you've made. Shooting mode, metering mode, battery life, ISO sensitivity, image quality, flash setting, shutter speed or aperture, and shots remaining should all be clearly noted on a high-end camera's display.

Video-out: Many cameras, even those in the low-end range, provide a video-out port so that you can view images on your television, or even program a slide show. It's an especially convenient way to share images with a group, and there are no further hardware or software requirements (beyond owning a television, that is).

Digital I/O: The I/O port is used for downloading images to your desktop; USB has become the norm for such transfers. To eliminate camera battery drain and the need to keep a USB cord handy, we recommend a USB card reader (about $30–$80). They're particularly useful if you want to download images from multiple cameras to the same system, as you only need to install drivers for the single card reader, rather than for all of your digi-cams.

LCD: We consider the LCD screen an essential in digital photography—don't even bother with the low-end cameras that lack this feature. Most LCDs measure between 1.5 and 1.8 inches and are available for playback, composition, and camera setup. Though composing your shot through the LCD is a big battery drain, it eliminates the parallax error associated with non-SLR optical viewfinders.

Close-up/landscape/self-timer modes: These special modes are commonly accessed by pushing a button or turning a dial, without the need for scrolling through menus. Macro photography (that is, using the close-up mode) is particularly popular among digital users, but not all close-up settings are equal. Check the specs to determine minimum focal distance in macro mode (this camera can focus as close as 0.8 inches—an impressively short focal distance).

Zoom control: Working the camera's optical zoom is generally accomplished with buttons or a lever. On many cameras, these controls can also be used in playback mode to carefully examine an image. Digital zooms vary, but in many cases are activated when the telephoto button is held in after reaching the maximum optical zoom focal length. Watch out for this type of activation. In fact, we recommend avoiding the digital zoom altogether.

Menu and 4-way rocker buttons: Every camera has a button that displays the interface menu on the LCD and some way of navigating that menu. Better cameras should also offer enough buttons or dials on the camera body to enable quick camera-setting changes without having to scroll through long menus.

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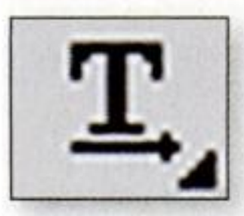
IN THE DARKROOM

Mastering the tools of your image editing program

You'll find a variety of image-editing programs populating retail store shelves, offering different degrees of manipulation. We happen to like Adobe's *Photoshop Elements*—it's an affordable version of the industry-standard *Photoshop* that entails a less steep learning curve. But for the most part, any digital darkroom program worth using will equip you with most or all of the following tools.

Tool	Function
	Magnetic Lasso: This tool enables you to select an object by drawing around that object freehand or by selecting its straight edges—the Lasso will "snap" to the edges of the object you're trying to select. Use it to select a complex object that's resting against a high-contrast background. Once your object is selected, you can manipulate it in isolation, without affecting other parts of your image.
	Magic Wand: Because it bases its selection powers on pixel color, the Wand is especially useful for selecting consistently colored objects with difficult-to-trace outlines. Adjust the Wand's tolerance to determine the range of color you want to select, then click the Wand in an area that represents the middle of that range.
	Clone Stamp: The chief tool of photo retouching, the Clone Stamp is the most popular, most effective way to remove anything from your image, from blemishes to unwanted relatives. Use the Clone Stamp to sample another part of the image, then "paint" the sampled area over the blemish, scratch, or relative you wish to remove.
	Red-Eye Brush: Red-eye occurs when the light from your flash is reflected off the blood vessels at the back of a subject's eyes, and happens most frequently when the flash is positioned too near the camera lens. To remove the effects of red-eye, first define the color you wish to remove (red, in this case), then select the color with which you want it replaced (by clicking on the non-red eye, for instance). Drag the Red-Eye Brush over the infected area to cure your subject.
	**Type Tool:** To add text to your image—either as a caption or as a design element—just click and start typing. Choose your font and point size, then position the text as you see fit. A new layer is usually created for the text, making it independently editable from the rest of the image.

TOP FIVE DIGITAL PHOTO TWEAKS

1 Cropping: Eliminate the unwanted excess around the perimeter of your photo before adjusting the parts you really care about. Draw the viewer's eye to your intended area of focus by getting in on the action and cropping the image close to your subject.

2 Auto Levels/Auto Exposure: Most image-editing apps offer some function that automatically adjusts the tonal range of your image. If you're not sure where to begin your touch-up, this automatic function is an excellent starting point. (You can always undo the action if you aren't pleased with the software's assessment of your image.) *Photoshop Elements* offers a few automatic commands in this regard, including Auto Levels and Auto Contrast, which perform an automatic adjustment of color and contrast, respectively. Brightness and Contrast sliders provide additional control over your image adjustments, should the automatic commands prove inadequate.

3 Color: If your Auto Levels command doesn't go far enough, you can manually adjust your image's hue (the color itself), color saturation (color purity or intensity), and brightness (of a specific color). *Photoshop Elements* includes sliders that allow you to monkey with each. Many apps provide automatic color enhancement options, such as "vivid" or "natural." *Elements* includes a Color Cast command to remove casts, and a Variations function lets you adjust color balance, contrast, and saturation by choosing your favorite from a selection of thumbnails.

4 Red-Eye: Zoom in on your subject's red irises and use the Red-Eye Brush (or a similar tool) to replace the red with your subject's natural eye color—or unnatural eye color, if you prefer.

5 Sharpen: Once you've made other adjustments, sharpen the lines in your shot using the Unsharp Mask filter. Note, however, that if your image is very out-of-focus to begin with, no amount of Unsharp Mask will change that. And don't overdo it with this filter, or your lines will end up jaggy.

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SONY

DREAM ON™ > > > >

FIRST IT ELIMINATED VINYL.
THE PHOTO ALBUM IS NEXT.

For those of you who don't remember, a vinyl album was a big, dusty, scratchy, round thing that people used to play music. Until the day the CD arrived. So simple, yet revolutionary. So small, yet full of space. So thin, yet practically indestructible. The rest is history. Nowadays, the CD is the universal digital media standard everybody knows and trusts. With that in mind, Sony created the new CD Mavica® digital camera. The first and only digital camera line to capture and burn crisp digital images onto a universal 3" CD-R that's just under $5. With advanced features like an InfoLithium® rechargeable battery, up to 3.3 Mega Pixel and 3x Optical Carl Zeiss® lens on select models, you can easily take, share, and store up to 1,300 images on a 156 MB CD-R, virtually forever. And don't get rid of your photo album. Everyone knows how valuable vinyl can be these days. For more information or your nearest retailer, visit us at **www.sony.com/di**

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PICK A PRETTY PRINTER

...and check out some other means of sharing your masterpieces.

Good photo printers are increasingly easy to find, and their print quality has improved to the point where many home-printed digital images are mistaken for "the real thing." But the first rule of shopping for a photo printer is to ensure that it's designated as such. If the printer isn't billed to deliver photo-quality images, it probably won't.

Two technologies define the sub-$1,000 field of photo printers: dye-sublimation and inkjet. Dye-sub and inkjet printers differ significantly in the way they produce prints. Dye-subs employ a thermal transfer ribbon that holds cyan, magenta, and yellow dyes and use heat to melt small amounts of dye onto the paper. The process is highly exacting, resulting in excellent continuous-tone prints.

Inkjet printers spray ink onto a page through a tiny nozzle. It's far more difficult to create a continuous-tone image with an inkjet printer, though a number of inkjets do an excellent job of creating the illusion of seamless continuity. Inkjets are less expensive than full-size dye-subs and generally provide you with more creativity options in terms of ink selection and media, such as archival or DayGlo inks and silk or fine art papers (see "Paper Matters" on page 33).

The inkjet printers we tested here boast maximum print resolutions of 2880x720dpi and 2400x1200dpi, respectively. Competitive inkjet photo printers generally offer at least 1200dpi resolution as an option. Dye-sub printer resolution, on the other hand, is an entirely different story. Because of the differences in the printing process, a 300dpi dye-sub printer will produce a smoother image than most inkjets.

We tested a few sub-$1000 photo printers—a dye-sub and two inkjets—for a closer look at some affordable options.

Olympus P400 Printer **It's the first affordable dye-sublimation printer we've seen—and we like it.**

ONLINE PHOTO SERVICES

This relatively new phenomenon provides space online where you can display, print, and purchase photos. We checked out a few.

CLUB PHOTO (WWW.CLUBPHOTO.COM)

Display your photos online and order prints of any uploaded images, or mail in a roll of 35mm or APS film, pay $1 for processing, and Club Photo will post hi-res files to your page for free. You can purchase prints, frames, and a slew of products imprinted with your photos, and Club Photo offers a free Palm application, *Album-To-Go*, for viewing images and slide shows on your PDA.

SNAPFISH (WWW.SNAPFISH.COM)

Snapfish is more concerned with the basics: upload and display your photos, order prints, or send old-fashioned film in to be developed. The service will develop the first three rolls you submit and send you prints for free. Beyond that, it's $1.99 per roll, which includes both processing and prints. Snapsish also posts the files to your account online, so you can order reprints or gifts.

SHUTTERFLY (WWW.SHUTTERFLY.COM)

Shutterfly offers uploading, storing, sharing, and printing capabilities, plus allows you to perform basic editing on your images online, such as cropping, red-eye removal, and special effects such as sepia mode. The service offers 35mm film processing, too, but charges $4.79 for the processing alone. Its gift collection isn't extensive, but does offer printed cards, printed customizable albums known as Snapbooks, and a variety of picture frames.

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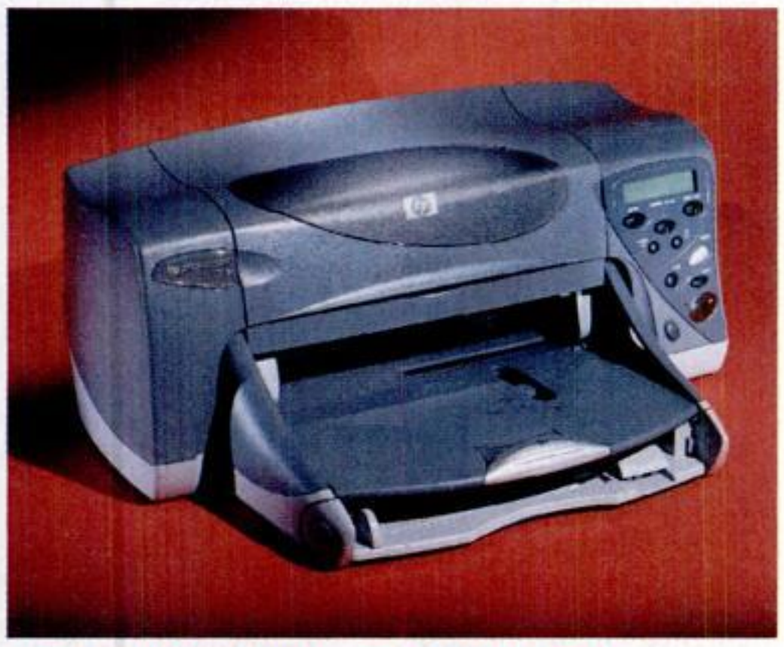
OLYMPUS P-400

$1,000, www.olympusamerica.com, 877.337.1507

• **MAXIMUMPC Verdict: 9**

The Olympus P-400 forges new ground for dye-sub printers, offering prints in the neighborhood of 8x10 inches for a relatively reasonable cost. Granted, the P-400 is still significantly more expensive than most inkjet photo printers, but for the difference in price you get professional-quality, continuous-tone prints that rival those you'd bring home from the photo lab. You also get the option to print directly from CompactFlash and SmartMedia cards, and the P-400 prints far faster than inkjets—a full-size print takes just 90 seconds.

Epson Stylus Photo 785EPX Printer **An inkjet that delivers near dye-sub results at a quarter of the price.**



Hewlett-Packard Photosmart 1218XI Printer **It's not bad, but we've seen better.**

Dye-sub media is traditionally quite pricey because the paper requires a special coating. Still, this printer's ribbon-and-paper cost works out to a relatively reasonable $1.90 per print. Olympus rates the print longevity at about 15 to 25 years under optimal conditions, which is similar to that of most "archival" inkjet papers currently available.

Though the best inkjet printers give the P-400 a run for its money in continuous-tone print quality, we think spending the extra money for a dye-sub guarantees a consistently smoother rendition of your images. If you require prints that stand up to close scrutiny, the added investment is worth it.

EPSON STYLUS PHOTO 785EPX

$250, www.epson.com, 800.873.7766

• **MAXIMUMPC Verdict: 9**

MAXIMUM PC KICK ASS PRODUCT

The 785EPX produces the cleanest, smoothest prints we've seen yet from an inkjet printer. In fact, it comes close to replicating the continuous tonal quality of the Olympus dye-sub printer—at a quarter of the price.

Digital photographers have long favored Epson printers because they consistently deliver high print quality at reasonable prices. The 785EPX continues this tradition, with a hefty 2880x720dpi maximum resolution, a six-color ink set (the standard CMYK, plus light cyan and light magenta), and four-picoliter-size ink droplets that make for smoother prints. Using the printer's PCMCIA card slot and an adapter, you can print directly from memory cards, and an optional 1.6-inch print monitor ($100) is availablefor previewing images if you're printing without a computer.

The 785EPX is the first Epson printer to use the company's new PRINT Image Matching technology. When used in conjunction with a camera enabled with the same technology (from Sony, Casio, Olympus, Kyocera, Ricoh, Toshiba, Konica, and, of course, Epson), the printer should yield a print consistent in appearance with the image file. We haven't yet tested this feature, but in theory it's a sound idea, especially for those printing directly from memory cards.

The printer shakes and shimmies a bit while it's at work, but we didn't find it to be especially obnoxious. We loved the results at the high-resolution 1440dpi setting, but were less enamored with that setting's print times. It takes more than 11 minutes to print a 9MB 8x10, and more than seven minutes when the "High-Speed" box is checked.

HEWLETT-PACKARD PHOTOSMART 1218XI

$500, www.hp.com, 888.999.4747

• **MAXIMUMPC Verdict: 7**

The Photosmart 1218xi inkjet printer offers beefy resolution (2400x1200dpi maximum), two-sided printing (front and back of a piece of paper), and fast print time (about 4.5 minutes for a 9MB 8x10). But overall, the Photosmart's prints simply don't hold up against the Epson 785EPX's output.

The Photosmart's image quality is pleasing and its color rendition is quite good, especially when using the ColorSync setting . But close scrutiny of the photos reveals faint patterns that distinguish these prints from their dye-sub counterparts or the smooth, chemically produced prints you take home from the lab. They weren't excessively noticeable, but were obvious when compared to the unblemished prints from the Epson. We also found the Photosmart's paper-loading mechanism to be cumbersome, and the 4x6-print photo tray involved too much guesswork when positioning the paper.

Like the other printers we tested, the Photosmart 1218xi is capable of printing directly from CompactFlash or SmartMedia memory cards. It's also infrared-enabled, so you can beam photos from an IR-capable camera directly to the printer. But, overall, we weren't blown away by the Photosmart's prints, and at the end of the day, that's the main reason you're buying a photo printer. ■

PAPER MATTERS

All papers are not created equal. Lightweight, multi-purpose inkjet paper is just fine for printing lines of text, but specially made photo papers will yield much better results when it comes to printing images. If you feed regular loose-leaf into your inkjet, you probably won't get the kind of results you're looking for.

Quite a few variables are at work in any printer/ink/paper combo, but photo paper's most important feature is its polymer coating, which keeps the ink from soaking into the paper and spreading out too much. You'll pay more for it, but that coating provides two very important advantages: increased saturation and intensity of blacks, and increased image sharpness. For the most consistent, reliable results, begin with the paper that's recommended by your printer's manufacturer. It's generally sold under the manufacturer's name, has been thoroughly tested on the printers in question, and is formulated to deliver optimal quality specifically on that printer and the ink cartridges sold with it.

That said, a wealth of third-party photo and fine art specialty papers are available. As long as these papers fall within the weight requirements (thickness) specified by your inkjet photo printer's specs, they're likely compatible with your printer. Check the paper specs, or consult **www.inkjetart.com** or **www.digitalartsupplies.com** for any known compatibility issues.

A print's lightfast quality—the amount of time it takes for a print to fade or for its colors to shift—is based on the chemical interaction between the ink and paper coating, along with the atmospheric characteristics in which the print is displayed. Traditionally, coated papers have employed chromatic enhancers, which oxidize the ink and make colors appear more brilliant. Unfortunately, these enhancers also cause a relatively rapid deterioration of the image. The new archival papers on the market have been reformulated to produce brilliant, saturated color without these enhancers, thereby increasing print life to 5, 10, or even 25 years, depending on the paper. Testing methods to determine such longevity claims are still evolving; consult the Wilhelm Imaging Research web site (**www.wilhelm-research.com**) for an independent analysis of various papers and their claims.

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Wild Cards!

Ready to gamble on a new videocard? Some can do much, much more than just 3D acceleration. We deal you five eclectic boards that can reinvent the way you use your PC.

JACK OF ALL TRADES
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KING OF DIAMONDS
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PRETTY LADY
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There's more to life than just gaming. Sure, if you buy a GeForce3, it will handle your 3D acceleration needs better than any other card around—but what if you don't care about 3D gaming? Does videocard upgrading suddenly become unnecessary?

Not by a long-shot.

We're here to show you a full house of different cards that can do nearly anything you might ask for, no matter what your PC passion is. The line-up includes:

- **DO-EVERYTHING CARDS** that allow you to capture and edit video, watch TV, and even record TV shows directly to your PC's hard drive (just like the TiVo video recorder).

- **MILD-MANNERED DUAL-HEAD CARDS** that allow you to span a single desktop across two displays—perfect for increasing your screen real estate at a low, low price.

- **CONTENT CREATION CARDS** that are de rigueur for creating 3D models and working in high-precision CAD applications.

- **HDTV TUNER CARDS** that let you view high-resolution TV broadcasts off your PC—all at a fraction of the cost of a new HDTV set.

- **MPEG-2 DECODER CARDS** that can turn your PC into a DVD console.

Some of the cards we'll be looking at perform more than one of the functions listed above. But none of these cards is entirely without faults. Indeed, while three of the cards offer 3D acceleration, their frame rates don't even approach the power of nVidia's finest. So don't let your next videocard purchase become a crapshoot. Read this story and study the odds. Our tour begins with a look at do-everything cards, and ends with a report on performance in 3D gaming.

By Will Smith

PHOTOGRAPHY BY JÖRN BLOHM

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Hauppauge WinTV-HD: Perfect for viewing high-res, digital TV shows on your PC's monitor.

Matrox Marvel G450 eTV: This do-everything card can serve almost all of your entertainment center needs.

Elsa Synergy III: A hardcore content-creation card for CAD fanatics and 3D developers.

ATI Radeon VE: With this dual-head wonder, you can run two monitors from a single AGP slot.

Real Magic Hollywood Plus: MPEG-2 decoder cards can turn your PC into a DVD console.

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Do-Everything Cards

The Jack of All Trades

With more tricks up their sleeves than Siegfried and Roy, do-everything videocards can turn your PC into the ultimate entertainment box.

Face it: If you're not a gamer, there's no reason to shell out three bills for a new GeForce3. So that means there's no reason to upgrade your videocard, right? Wrong. A do-everything card can add a slate of strange and exciting features to your otherwise one-dimensional PC. A good jack-of-all-trades card will include:

- a TV-out connector to send your PC's video signal to a television set,
- a TV tuner that can pick up cable and broadcast TV signals,
- TV time-shifting capabilities for recording your TV shows onto your hard drive—just like the TiVo and ReplayTV personal video recorders (a.k.a., PVRs),
- video-capture to encode anything you like to a variety of video formats (say, AVI or MPEG-2),
- hardware-assisted MPEG-2 decoding for DVD movies,
- and, yes, hardware acceleration for 3D gaming.

A good do-everything card will not only offer these features, it will do so with aplomb for about $200. For starters, this means a generous assortment of inputs and outputs. The ATI All-in-Wonder Radeon, for example, supports S-video and composite video input, as well as VGA, DVI, S-video, composite video, and S/PDIF output. You might need all these connectors if you're intent on turning your PC into a full-fledged entertainment center. The card's software bundle must also be polished. We particularly like the Matrox Marvel G450 eTV tuner interface, whose "multi-channel preview" can provide thumbnail views of what's happening on up to 36 channels simultaneously. We have no idea when this digital magic will become commonplace on standard television sets, but it's available via your PC right now.

The Matrox card's multi-channel preview screen turns your PC monitor into a virtual TV station.

One of the best features of do-everything cards is the ability to grab video from almost any source, be it the built-in TV tuner, a camcorder, or a VCR. So what do you sacrifice when encoding video through, say, a Marvel G450 eTV rather than through a dedicated video capture card? Maybe nothing. Indeed, if you have a powerful CPU and high-res source material, you should see a video stream that's comparable to something grabbed by a dedicated card. The Marvel is capable of grabbing video at 704x480, but is ultimately limited by the speed at which your CPU can encode the video (if your CPU isn't up to snuff, you'll suffer dropped frames, which is unacceptable if you're serious about your video capture).

Codec support can also be limited. While do-everything cards can now encode to MPEG-2 (the same format used in professional DVD releases), we have yet to see one that can capture digital video in its native format via a FireWire interface. For this type of support, you'll need to get a high-end capture card such as the Pinnacle DV500, which supports both analog and digital capture, but doesn't include basic videocard capabilities. Digital capture is faster, and should preclude all artifacting, unlike even the best analog capture. If you want to do anything more than casual video editing and already have a DV camcorder, seriously consider a FireWire capture board.

Because do-everything cards support so many features ripe for use in a PC entertainment center, these cards beg to be connected to a television set. But buyer beware: We're not fans of using TV-out connectors for day-to-day computing because traditional TVs support a painfully low resolution (800x600) and are saddled with a fixed refresh rate that is also painfully low (60Hz). What's more, none of the do-everything cards we've tested include remote controls, and we're loath to replace the TiVos in our living rooms with a rig that doesn't include a remote (though a PC with TV time-shifting capabilities would be an awesome rig for TiVo have-nots).

As for the cards' time-shifting software itself, it's much more customizable than the TiVo interface, but lacks the level of polish that set-top PVR boxes offer. For example, the TiVo software works great with just a remote, but all the PVR software we've seen bundled with videocards requires the use of a keyboard and mouse, which is unfortunate, since very few people actually want to use a keyboard and mouse in their living room.

And while TiVo service is $10 monthly, we think that's a fair price to pay for program listings customized to your channel lineup and the ability to automatically record programs that, say, belong to a particular genre or include your favorite actor. You can add this functionality to your PC with third-party software, but we think it should be included in the videocard packaging. At least the cards do include the option to scan channels for keywords in closed captioning and record shows that include those words, as well as the ability to save text files of closed-caption commentary. You'll never have to pay $2.50 plus S&H for a transcript of "Crossfire" ever again!

Finally, a do-everything card can replace your 3D accelerator and stand-alone MPEG-2 decoder—if you're willing to sacrifice some speed and features. To wit, unless you have an HDTV and want to take advantage of the progressive anamorphic picture it's capable of displaying, your do-everything card's DVD player should be capable of more than sufficient MPEG-2 playback.

Do-everything cards do include some level of 3D acceleration, from the near-kick-ass 3D performance of the ATI All-in-Wonder Radeon, to the "I only play games every six months or so" acceleration provided by the Matrox Marvel G450 eTV. But, if you opt for one of these cards, be aware that your PC will *not* be a gaming powerhouse.

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In Focus: The Matrox Marvel G450 eTV

$230, www.matrox.com

The Marvel G450 eTV produces the highest-resolution, highest-quality video of any do-everything card we've seen and also supports DualHead for TV-output. But all of this fun stuff comes at the expense of passable 3D acceleration. True enough, our gaming benchmarks are designed to stress the most powerful of videocards, but the Marvel G450 also choked on less-demanding games.

No breakout?: In order to avoid incurring extra costs, the G450 eTV eschews the old-school in/output breakout box for a pair of proprietary DIN-style connectors on the back of the card.

Cool-Ranch flavor: The Marvel G450 eTV is definitely not a gaming card. In fact, its main chip runs at such a low temperature, it doesn't require any active cooling.

Ooo! A shiny bauble!: In order to get TV signals into the card, you'll need this big silver thing, which houses all the necessary hardware to pull a signal from either the airwaves (via a pair of rabbit ears) or a coaxial cable. We've seen more compact tuner-on-a-chip solutions before, but apparently Matrox hasn't.

Insert internal audio pass-through here: Sadly, the card doesn't include an internal audio pass-through to hand off audio streams to the soundcard. The G450 eTV is only equipped with an external cable.

THE SPECS

RAMDAC	360MHz
Memory	32MB 64-bit DDR SDRAM
Max resolution	2048x1536
Color depth	32-bit
TV time-shifting system requirements	600MHz or faster CPU 128MB RAM

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Dual-Head Cards

The Deuce

One videocard, two monitors—the perfect solution if you're low on funds, low on motherboard slots, and low on screen real estate.

Do you ever wish you had enough screen real estate to simultaneously browse the web and read e-mail without re-arranging windows? Do you ever wish you had more room to dock your palettes when working in *Photoshop*, *Premiere*, or *Painter*? Do you ever wish you could see two *Word* documents at the same time, and cut and paste text between them? If you answered "yes" to even one of these questions, it's time to consider a dual-monitor display.

Since Windows 98 arrived with built-in dual-monitor support, it's been possible to drop two videocards into a system, enabling two monitors that share a single desktop. But in order to get such multi-monitor mojo working, you've had to use a clunky (and sometimes expensive) mix of PCI and AGP cards, and occasionally sacrifice important features—such as 3D acceleration—in order to get your rig up and running. Confusion ensued with Win98's dual-monitor feature, as some videocards only worked when paired with an identical twin, while other cards only worked when paired with another vendor's videocard!

Enter the Matrox G200. The first consumer-level board to drive two separate monitors from a single card, the G200 made multiple-monitor support as easy as installing a new AGP card. The G200 and its successors, the G400 and G450, were the only multi-monitor boards available until 2000, when nVidia and ATI launched the GeForce2 MX and Radeon VE, respectively.

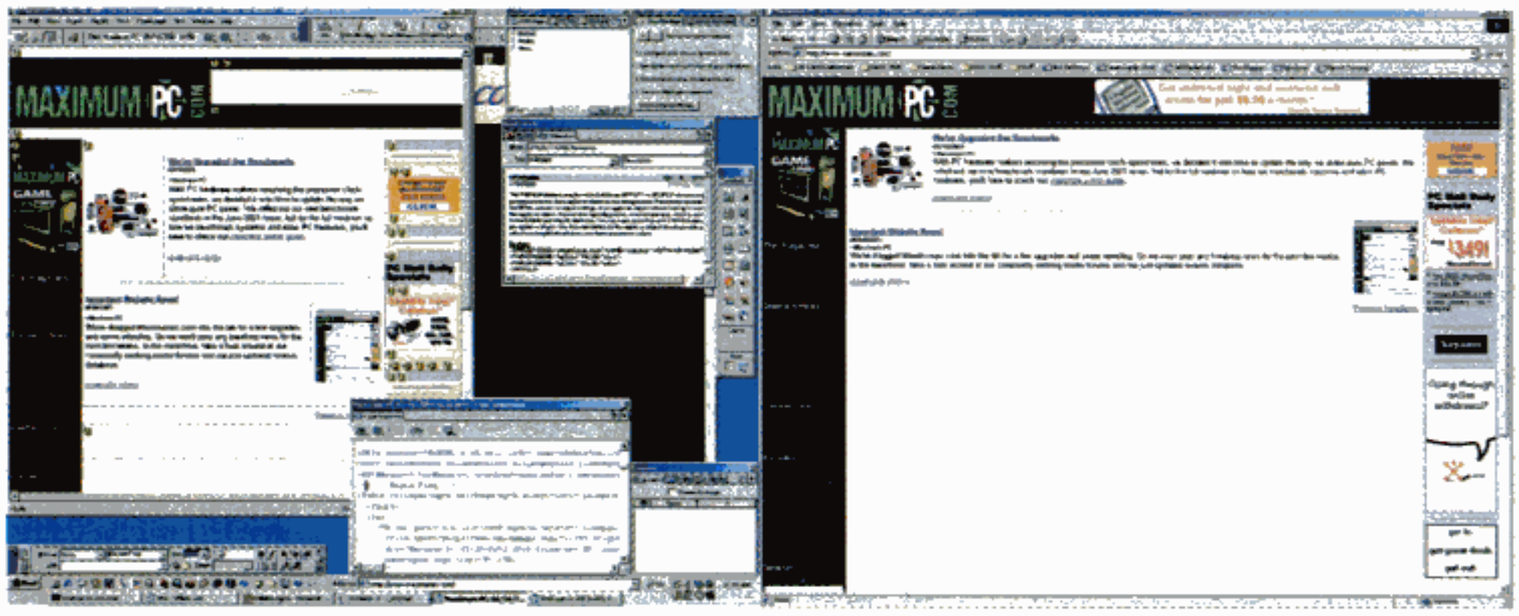
The beauty of good dual-head implementation is that there's no need for explicit multi-monitor support at the application level. For example, in Windows 98 and ME, dual-head cards treat each display environment separately, which allows you to set independent resolutions, bit-depths, and refresh rates for each monitor. Window size is also easier to control. If you place an application window in either the primary or the secondary display and hit the window's maximize button, the window will expand to fill only the display that it's in. Unfortunately, in Windows 2000, this feature only works with Matrox and ATI cards. The current drivers for nVidia cards simply stretch the desktop across both monitors using a massive resolution, such as 2560x1024.

Nearly every type of application user can benefit from dual displays, but what can a dual-head card do for gamers? The answer is nothing, unless the game has been specifically coded to leverage the screen real estate of two monitors. Despite a push from Matrox to make special use of dual displays in games, reception in the game developer community has been cold, with only two big-name titles supporting dual displays to date. *Microsoft Flight Simulator* uses the second monitor to display flight instrumentation, while *Star Trek: Armada* uses the second monitor to show close-ups of the battles being fought. Games that don't explicitly support dual-head will only fill the primary display because DirectX doesn't allow multiple 3D accelerators in one system.

Though you don't need express multi-monitor support in your apps to enjoy a dual-head card, both ATI and Matrox do ship special software enhancements. For example, Matrox's *eDualhead* software enables a keyboard shortcut that automatically opens new web browser links on your secondary monitor. ATI's *Hydravision* software, meanwhile, adds the Unix-like multiple desktop feature, allowing you up to nine different desktops, accessible via a hotkey, stacked on top of each other. After fooling with both of these software add-ons for several hours, we weren't convinced that either made our computing much more efficient—but you may feel differently.

By default, most dual-head cards are set up to use a CRT primary display and a DVI-based LCD secondary display, but most card manufacturers have a dual-VGA option, and others include an adapter that converts DVI to VGA. When choosing among connector options, you need to think about your existing monitor situation and how much desk space you can give up. Most people don't have room for two 19-inch CRTs, but teaming up a 15-inch LCD with an existing 19-inch CRT consumes very little additional desk space.

Besides being space-efficient, dual-monitor rigs can be cost-efficient. Let's say you're building a PC from scratch. A $100 dual-head card and two nice 17-inch aperture grille CRTs (at $350 each) totals $800 and offers about 253 square inches of screen real estate. Meanwhile, a $100 single-head card and a nice 21-inch aperture grille CRT (at $900) adds up to $1,000 and offers just 192 square inches of screen real estate. Granted, countless variables will affect your final cost-to-square-inch ratio, but we doubt you'll ever find a better value with a single-monitor config.



Here's an example of how we use dual monitors at *Maximum PC*: On our primary display, we run a whole bunch of *Dreamweaver* windows to edit our web site. On the secondary display, we view the fruits of our labor in *Internet Explorer*. If you've ever done site design, you know what a godsend this feature is.

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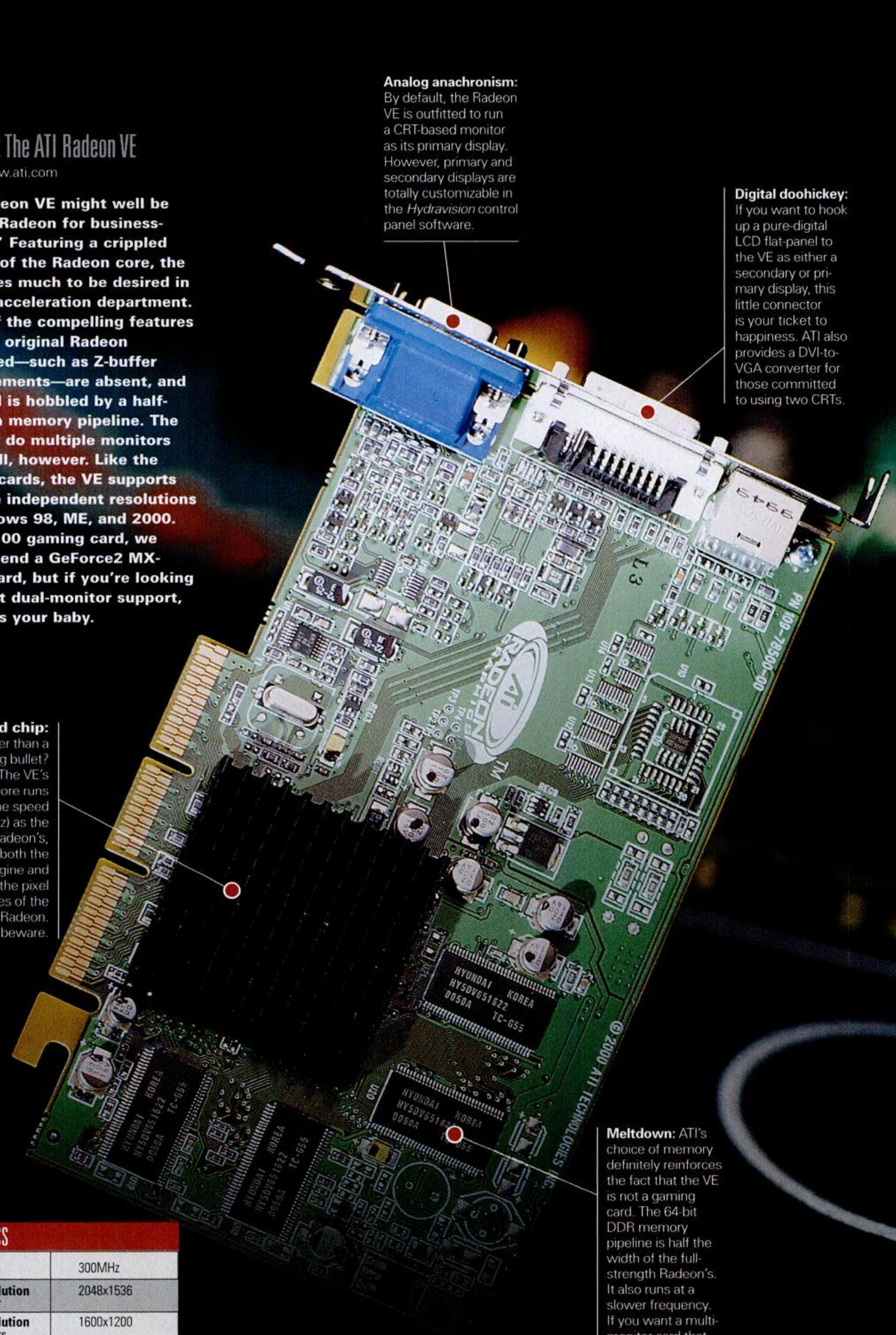
In Focus: The ATI Radeon VE

$100, www.ati.com

The Radeon VE might well be called "Radeon for business-people." Featuring a crippled version of the Radeon core, the VE leaves much to be desired in the 3D acceleration department. Many of the compelling features that the original Radeon pioneered—such as Z-buffer enhancements—are absent, and the card is hobbled by a half-strength memory pipeline. The VE does do multiple monitors very well, however. Like the Matrox cards, the VE supports multiple independent resolutions in Windows 98, ME, and 2000. For a $100 gaming card, we recommend a GeForce2 MX-based card, but if you're looking for great dual-monitor support, the VE is your baby.



THE SPECS

RAMDAC	300MHz
Max resolution one monitor	2048x1536
Max resolution two monitors, primary display	1600x1200
Max resolution two monitors, secondary display	1600x1200

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Content Creation Cards

The King of Diamonds

So you want to be the master of all polygons? You'll need a very special accelerator for 3D design projects.

A familiar face: The Synergy III sports a Quadro 2 MXR, which is basically nVidia's GeForce2 MX with special driver support for *3D Studio Max* and other CAD apps. Fun fact: Enterprising hackers on the Internet have discovered ways to solder their higher-powered GeForce2s into Quadro products!

Memory mismatch?: The memory on the Synergy III is identical to the 32MB of 128-bit SDRAM on a comparable GeForce2 MX board. Most CAD work doesn't require the massive memory bandwidth that gaming does.

Multi-mon mambo: Like the ATI Radeon VE, the Synergy III supports multiple monitors. Of course, the VE would scream bloody murder if presented with a task in *3D Studio Max*.

In Focus: The Elsa Synergy III

$400, www.elsa.com

The Synergy III is Elsa's budget entry into the content-creation forum, and it leaves out key CAD features, such as line anti-aliasing. Just before press time, nVidia also announced content-creation products based on GeForce3 technology. Key software products, such as *3D Studio Max*, will support the GeForce3's programmable shader tech natively, providing modelers and designers with realtime renditions of their creations.

Now that GeForce3 boards are available to the general public, why would anyone blow money on a *slower* 3D accelerator? Because pro-level 3D-development apps have a different set of requirements than 3D games. If you're interested in CAD (computer-aided design) or use 3D-modeling programs like *3D Studio Max*, you'll need a card that's been expressly designed for content creation.

Engineers use CAD applications, such as *AutoCAD* and *AutoDesk*, to create plans for everything from buildings to jumbo jets. Naturally, in these applications, the tiniest error could cause catastrophic problems. To avoid tragedies, the drivers for CAD cards are much less tolerant of errors than those of comparable gaming cards. While a gamer won't notice a few extraneous pixels in a game, those pixels could represent an extra weld in an engineering project.

Another feature that's vital to the CAD crowd, as well as to most 3D modelers, is line anti-aliasing. Just like the full-scene anti-aliasing that's supported by the best gaming cards, line anti-aliasing removes the "jaggies" from the edges of lines in wireframe models. Working with a 100,000-line mesh on a CAD box without line anti-aliasing is an exercise in frustration. Indeed, line anti-aliasing makes it easier to distinguish between adjoining and parallel lines, which in turn makes it easier for designers to work with more complex models. Because consumers have no need for this type of anti-aliasing, it's only supported in hardware on pro-level accelerators.

Most consumer-level accelerators made before 1999 only support 16- or 24-bit Z-buffers. The Z-buffer controls the third dimension of each model—that is, the depth of each pixel relative to the front of the 3D scene. An extremely deep Z-buffer isn't important when playing games, but it's very important in CAD work. For this reason, traditional CAD boards have higher-precision, 32-bit Z-buffers.

The final difference between a gaming card and a content creation card is the application support. A gaming card need only support the Direct3D and OpenGL APIs; support for specific games isn't necessary. But some CAD programs, such as *3D StudioMax*, require special drivers to function properly. Make no mistake, this driver development takes lots of time and costs lots of money—and all of these expenses are, of course, passed on to the consumer in the form of hugely expensive software and hardware (*3D Studio Max* costs $3,500 and the best content creation cards can run as high as $2,000). And even if your favorite modeling app doesn't require specific support in your card's drivers, it might still benefit from highly optimized drivers.

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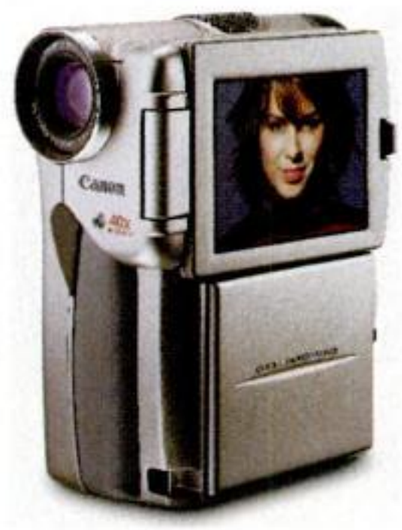

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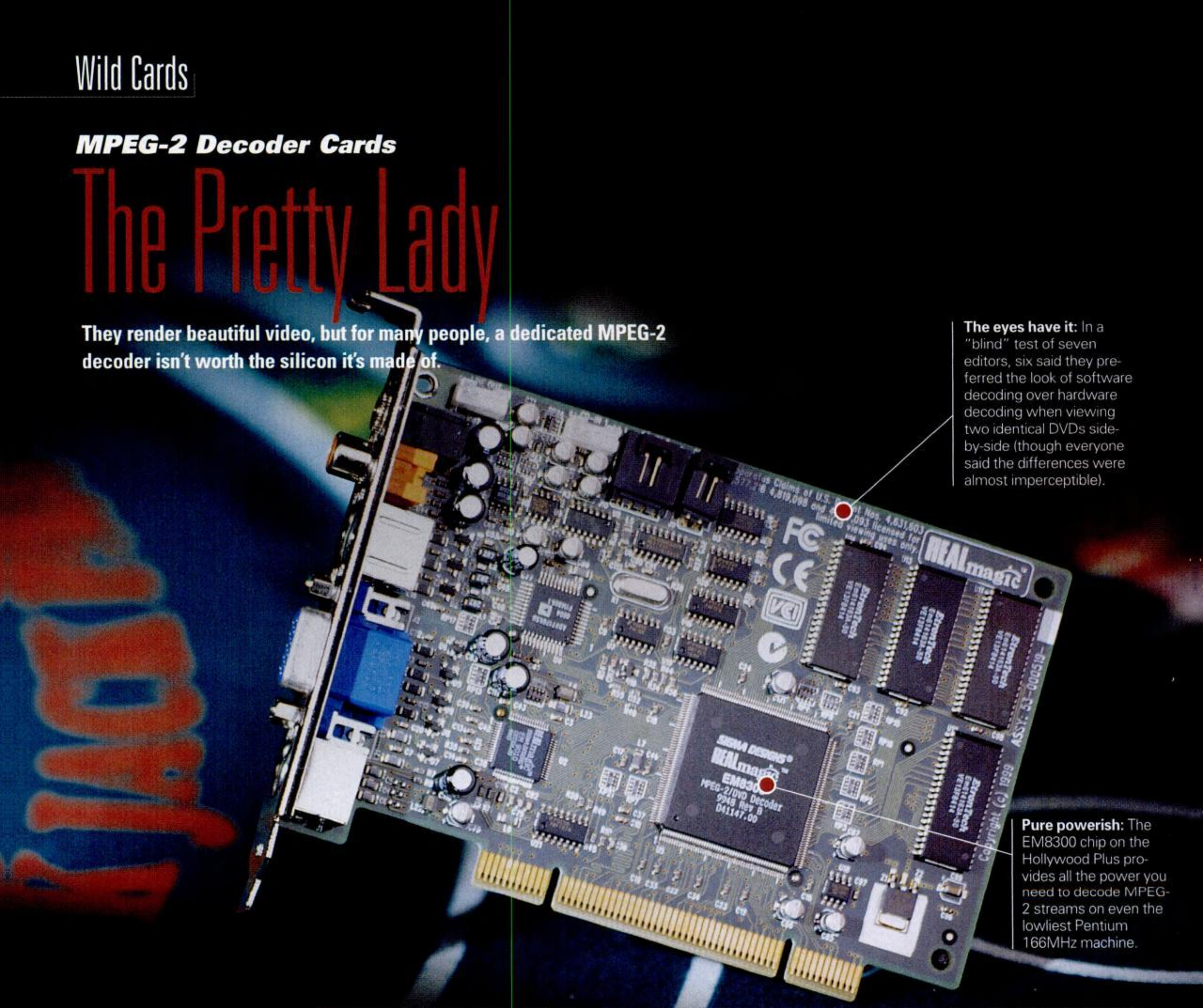
MPEG-2 Decoder Cards

The Pretty Lady

They render beautiful video, but for many people, a dedicated MPEG-2 decoder isn't worth the silicon it's made of.



The eyes have it: In a "blind" test of seven editors, six said they preferred the look of software decoding over hardware decoding when viewing two identical DVDs side-by-side (though everyone said the differences were almost imperceptible).

Pure powerish: The EM8300 chip on the Hollywood Plus provides all the power you need to decode MPEG-2 streams on even the lowliest Pentium 166MHz machine.

In Focus: Real Magic Hollywood Plus

$65, www.sigmadesigns.com

We've always been impressed not only with the quality of the Hollywood Plus' DVD playback, but also with its robust software. Real Magic cards aren't for everyone, though. Unless you want widescreen anamorphic playback, software DVD players will serve you just as well.

With a minimum capacity of 4.7GB, DVD discs can hold entire feature-length Hollywood movies—if those movies are encoded with an efficient compression format like the miracle known as MPEG-2. This format offers resolutions of 720x480 and 1280x720 at 60fps, along with all the 5.1 surround sound we've come to expect from Tinsel Town's most bombastic productions. The question is, How to decode the MPEG-2 into something your PC can understand?

Well, today, most PCs have strong enough CPUs to handle the decoding duties in realtime without dropped frames. But back in 1997 and '98, CPUs were generally not up to the task. So, to assist the underpowered CPUs, vendors such as Creative Labs developed add-in boards that handled all of the MPEG-2 decoding work in dedicated hardware. But why would you need a dedicated hardware decoder in today's current climate of 1GHz powerhouse procs? Well, if you've got a widescreen, 16:9 ratio TV, dedicated decoder cards are de rigueur for displaying anamorphic DVDs. These DVDs are higher-res versions of the familiar letterboxed DVDs and are designed to be shown on widescreen TVs (although they will also work on normal 4:3 ratio TVs). What's more, while a dedicated MPEG-2 decoder won't provide Dolby Digital or DTS decoding, it will provide a pass-through for that digital audio stream, which is a bonus if your PC's soundcard isn't equipped to output those surround sound signals.

MPEG-2 is a lossy compression format that's able to compress video at about a 10:1 ratio. An MPEG-2 encoder compares each frame to the one that precedes it and records only the differences between the two frames, rather than each frame in it entirety. This is the same basic technique as earlier and later codecs, but MPEG-2 is special because it's just perfect for DVD video. MPEG-2 is also the video format of choice for set-top PVRs (such as TiVo), digital cable, and digital satellite services, such as DirecTV and the Dish Network. Because MPEG-2 is so prevalent across so many media, you'd think that you could use an MPEG-2 decoder with other streams as well. Unfortunately, that's not usually the case. Most decoder cards are only compatible with DVD video.

We've previously advocated dedicated MPEG-2 decoder cards because they offered superior visual quality in DVD movies—software decoders rendered more noticeable artifacting and were prone to dropped frames. But now that almost every videocard has key MPEG-2 decoding features (such as motion compensation), software decoders do just fine. MPEG-2 cards should only be bought for digital audio and anamorphic DVD support.

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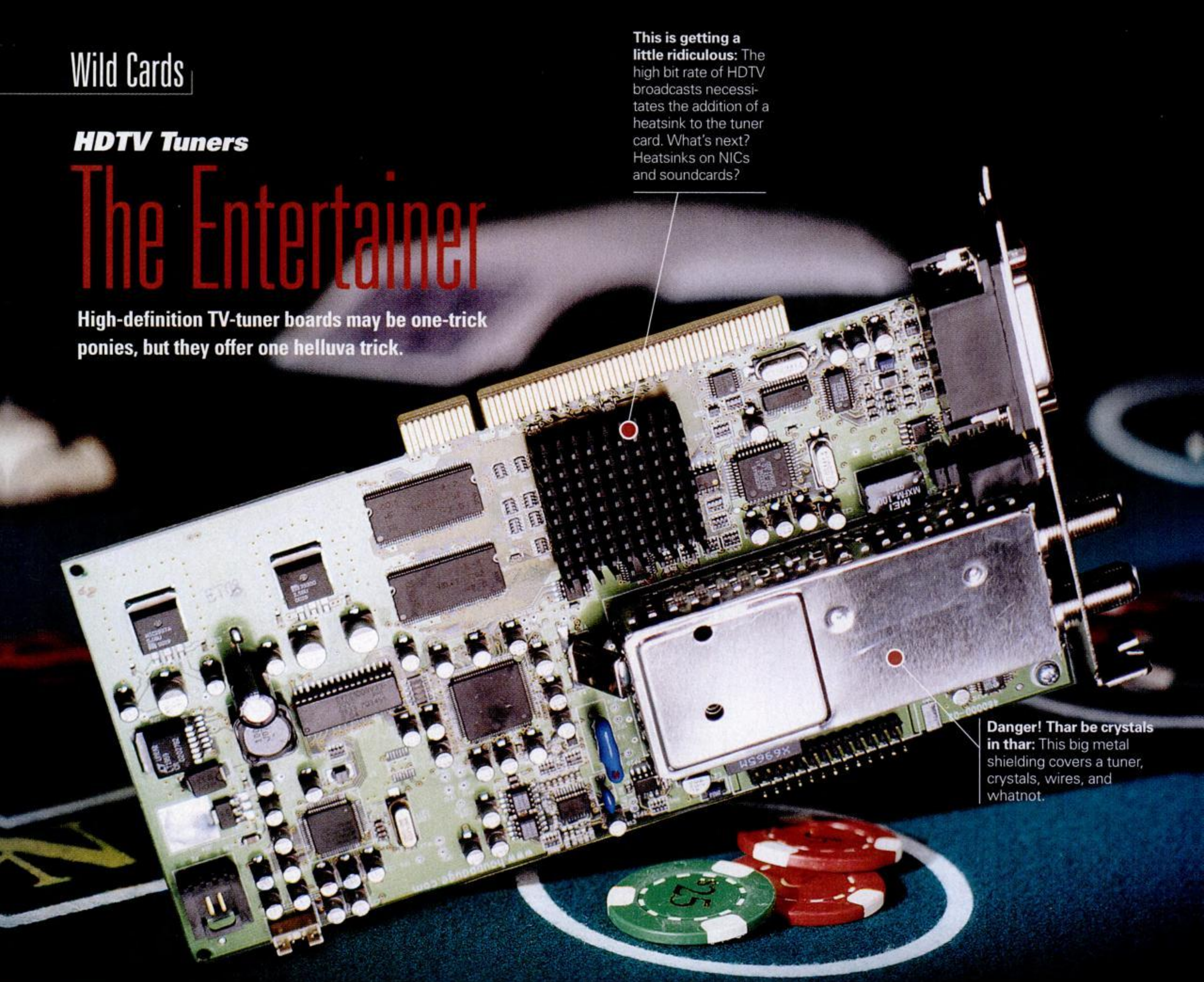
HDTV Tuners

The Entertainer

High-definition TV-tuner boards may be one-trick ponies, but they offer one helluva trick.



In Focus: The Hauppauge WinTV-HD

$400, www.hauppauge.com

High definition TV is the future, and the future-proof Hauppauge WinTV-HD will turn your computer into both a new-fangled HDTV and a plain old analog TV for compatibility's sake. Once we got over the installation pains, we really dug the few high-res broadcasts we were able to catch.

The promise of HDTV is simple: You get to watch TV at computer resolutions instead of the paltry 640x480-equivalent resolution we're used to seeing, as laid out by the NTSC spec. Although the U.S. government has specified that most broadcasters have until 2006 to convert, if you live in an urban area, chances are good that some of your local stations are already broadcasting HDTV.

So why buy a tuner card to watch HDTV on your computer? Because teaming up your computer monitor (which is more than capable of displaying HD resolutions) with a $400 HD-tuner card is significantly cheaper than buying a $3,000 HDTV and a $1,000 set-top box, and the picture should be just as enchanting, albeit a little smaller.

An HDTV tuner is basically a hepped-up version of the same tuners found on do-everything cards but the software provided with this Hauppauge tuner leaves much to be desired. For one, you don't get any fancy TV time-shifting features. But this should come as no surprise: Each second of HD video requires around 2MB of disk space, while with regular video, you can get a whole minute of footage into that same 2MB chunk. The Hauppauge also lacks multi-channel preview, which is a shame, because the feature is so friggin' cool.

Why don't do-everything cards with their fancy-schmancy TV tuners support HD resolutions as well? We've been asking videocard vendors that for almost a year and have always received the same stinking answer: There's not a large enough market to make HDTV support cost-effective in existing products. That would explain why only Hauppauge is currently shipping an HDTV tuner card.

Which brings us to the crux of the problem. As of April 15, 2001, there were just 145 stateside TV stations—and no cable TV operators—broadcasting digital HDTV signals. Of the top 30 television markets, eight are still bereft of HDTV broadcasts, according to the FCC. So, naturally, an HDTV tuner would be a silly purchase if you're not going to have service until 2006. We therefore recommend you head to TitanTV.com. Once you enter your address and zip code, the web site will create a schedule for you of stations broadcasting digitally, and highlight the programs that will be broadcast in HDTV resolutions. Please note, however, that even if a digital station serves your area, there are still only a few select shows cast in HDTV resolution.

Do you need an HDTV tuner card right now? Probably not. But if you live in an area served by a station broadcasting HDTV, and that station has programming you'll watch (who really watches ABC, anyway?) an HDTV tuner may be right for you.

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Connectors, Connectors, and More Connectors

Stealing a Sideways Glance

What good is a wild card if you can't pair it up with something useful? Here are the ins and outs of all the cards in our hand.

Matrox Marvel G450 eTV

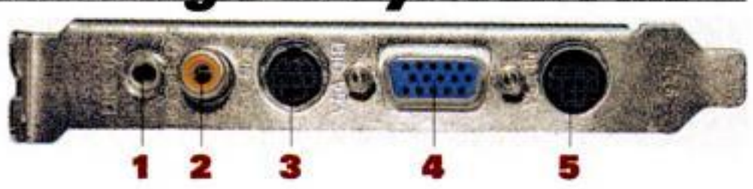
1 The eTV doesn't include a breakout box (like previous iterations of the Marvel did), so proprietary connectors are used instead. This proprietary A/V output connector accepts a cable with five plugs on the other end—one of the plugs can send an audio stream to the line-in jack of your soundcard.

2 The coaxial input is for either an antenna or cable connection.

3 The second proprietary connector is the A/V input jack, which accommodates both composite and S-video input, as well as RCA audio input.

4 The trusty VGA connector sends beautiful, high-resolution images to your computer monitor.

Real Magic Hollywood Plus



1 The line-out jack can handshake with the line-in jack on your soundcard—but this strategy down-mixes the Dolby Digital 5.1 sound stream of your movie into a crappy analog stream. We prefer using the digital S/PDIF or at least the Hollywood's tidier internal audio connector.

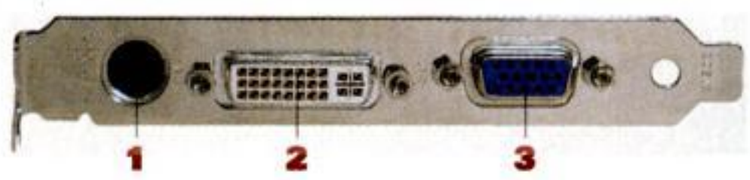
2 A coaxial S/PDIF output is perfect for sending a 5.1 sound stream—Dolby Digital or DTS—to your home theater or digital speakers.

3 S-video output is always nice, but is especially key for a card like the Hollywood Plus. S-video-to-composite converters are available, but they usually result in bad-looking pictures.

4 The VGA interface is for connecting your card to a regular-old monitor. The Hollywood Plus will also work with a pass-through cable, so you can route a video signal from your existing videocard into the Plus, and then from the Plus into your monitor.

5 When you use the pass-through cable, it plugs into this connector. Remember: Sigma provides the special proprietary pass-through cable, so if you lose it, you'll need to get a new one from the company.

ATI Radeon VE



1 Like most Radeon cards, the VE includes an S-video output, so you can work at blindingly low resolutions on a traditional TV set.

2 The VE's DVI output provides a fully digital interface between your videocard and a DVI flat panel. For people who don't own a flat panel, ATI also provides a DVI-to-VGA converter.

3 Just like every other videocard made in the past 10 years, the VE includes a standard VGA output.

Elsa Synergy III

1 For your multi-monitor needs, the Synergy III includes a DVI-output for flat-panel support. Please note that the DVI-to-VGA converter supplied with the Radeon does not work with this card.

2 VGA is everywhere. If the Elsa smarties hadn't included VGA support on this card, we'd think they'd gone a bit soft in the head

Hauppauge WinTV-HD

1 The top two connectors on the HDTV card are for the card's dual tuners. One tuner is for cable; the other is for airborne HDTV broadcasts. You'd think that with two tuners it would be possible to watch more than one channel at a time, but we weren't able to get Hauppauge's software to do that.

2 The line-out serves as an audio output to your soundcard—for those who don't want to fool with internal audio cables. By changing a jumper on the board, you can also make it serve as a S/PDIF-out (for the digital audio encoded in HDTV broadcasts).

3 Hauppauge's proprietary connector goes to an included breakout box. This box includes A/V input, an infrared remote sensor, and all the cables necessary for a monitor pass-through. ■

OK, So What About 3D Gaming?

As we stated earlier in this article, none of these wild cards are expressly designed for 3D gaming—but that doesn't mean no one will ever try to run a game off one of these freaks of videocard nature. So we decided to benchmark the applicable cards with our suite of standard gaming benchmarks. For the sake of comparison, we also included the scores of the VisionTek GeForce3 reviewed last month.

DARE to COMPARE	Quake III	3DMark	Aquamark
Matrox Marvel	5.4 fps	4.6 fps	4.2 fps
ATI Radeon	5.6 fps	3.4 fps	wouldn't run
Synergy III	10.7 fps	10.3 fps	wouldn't run
GeForce3	**51.4 fps**	**34.5 fps**	**23.5 fps**

NOTE: Best scores are bolded. All benchmarks are run with v-sync and FSAA disabled. 3DMark2001 runs with "D3D Pure Hardware" selected. Full benchmarking details at http://maximumpc.com/benchmarking/index.html.

NOW THIS

The beauty of the GeForce3's vertex and pixel shaders must be seen to be fully appreciated. In stunning detail, we present the best 3D-gaming graphics ever.

By Sean Downey

With the introduction of DirectX 8 and nVidia's GeForce3 chipset, 3D gaming has gone Hollywood. Indeed, some of the PC games currently in development will be one step closer to the CG magic you'll see this summer in animated flicks such as Pixar's *Monsters, Inc.* and Square Picture's *Final Fantasy*. Falling by the wayside will be the boring, blocky models and bland texture maps that have plagued so many otherwise-compelling 3D games.

The GeForce3 moves beyond the constraints of the traditional 3D pipeline by including programmability directly onboard the chip itself. The vertex and pixel shaders that bulk up the GeForce3's transistor count, for instance, can be used to stretch, twist, and resize 3D models, and can even use mathematical functions to apply realistic wood grains or random nicks and scratches to texture maps. Rather than relying on the CPU to prepare data for the 3D accelerator, a PC game can now hand everything off to the videocard and let it accelerate the entire process. And even after an image hits the screen, special game code can make further changes to what you see, altering everything from the shape of a model to the reflectivity of an object's surface—all on the fly.

On the following pages, we provide vivid evidence of how much closer to reality the next generation of PC games will bring us. Eventually, programmable graphics processors such as the GeForce3 and its inevitable competitors will be able to perform the same sort of fancy-schmancy tricks that the folks at Pixar and Square use in their movies. And it'll all be interactive.

IS 3D GAMING!

Crytek Studio's *X-Isle: Dinosaur Island* borrows more than plot points from *Jurassic Park*. This tactical first-person shooter is set on an uncharted island teeming with some of the most gorgeously rendered extinct reptiles ever seen by gamingkind.

1. As you can see in the massive legs of this Tyrannosaurus Rex, the new vertex blending techniques available in DirectX 8 make it much easier to realistically animate complex models such as a dinosaur's kneecap. Using skeletal animation techniques, Crytek Studio can make this T-Rex walk the earth without breaking him up into unnatural-looking parts.

2. Tactile surface details such as these bump-mapped scales add surface depth and bumpiness to the skin of the T-Rex without adding more polygons to the model. The GeForce3's pixel shaders create especially awesome bumped surfaces because they realistically interact with the lighting that falls across them on a per-pixel basis. This casts different shadows and reflects different bumped details that shift according to each light source's movement and placement.

3. Notice anything familiar about this tree? It's the same as the one down to the right, which is the same as the one behind it, and so on. Together, they look like a real forest because each has been shifted, tilted, and resized a bit. Therein lies the beauty of a programmable graphics processor—you can save memory and bandwidth by using the same model coupled with a script that drives the different ways it can be rendered.

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Massive's *AquaNox* is a space shooter set thousands of feet below the ocean's surface. Massive is using hundreds of vertex and pixel shaders to create truly stunning special effects that immerse you in a world of hot 'n' heavy aquatic action.

1. Volumetric fog creates the illusion of weight as the denser fog sinks to the bottom of the ocean. Say hello to our new friend the 3D texture, which has been used to generate this dense vapor effect. Where old fog techniques relied heavily on alpha-blending tricks and murky textures, 3D textures such as this can be generated without the use of bitmaps—you just need a pixel shader and an algorithm.

2. Massive's Krass graphics engine does a good job of simulating radiosity lighting (the vertical rays of light), which is a computationally intense process that tracks the lighting in a scene as it bounces off every visible object. This is particularly important in an underwater environment like the one in *AquaNox*, because there are many microscopic particles of dust floating around in the water and reflecting the light. If this were rendered with more traditional radiosity techniques, frame rates would grind to a halt.

3. Caustic lighting effects are also incredibly computationally intensive, but Massive does a decent job of simulating them with various pixel-shader tricks. The idea behind caustic lighting is to realistically replicate the refraction of light from a curved surface.

4. Using high-order surfaces, which allow curves to be defined by control points instead of triangles, the *AquaNox* development team can create the appearance of curved surfaces without bottlenecking the pipeline with too many triangles. A curved surface like this one on the fighter ship only needs a few control points defined before a graphics processor such as the GeForce3 can intelligently calculate the vertices necessary to complete the construction of the scene.

Chameleon from nVidia is a demo designed to show off the versatility of pixel shaders. This shot demonstrates reflective Blinn Bump-mapping, which is just a fancy name for truly reflective per-pixel bump-mapping. This isn't some funky environment-mapping trick, mind you. The Chameleon's environment is accurately mirrored on the surface of its skin—it even reflects the Chameleon itself! Since this effect is done with a pixel shader, no extra bump or environment textures must be created.

Silicon Dream's *Footballer* demo is the only place you can currently see the incredible detail of this soccer player—you'll have to wait a bit longer before you see it in shipping product. This model boasts 8,000 polygons; 29 bones are used to get her to realistically juggle the ball. Just like the joints of the *X-Isle* dinosaurs, the Silicon Dream soccer players use vertex blending to smooth the rough connecting points where animated polygons meet.

Grin's *Ballistics* is a futuristic racing game set in a dismal urban wasteland. Using both vertex and pixel shaders, Grin has created some very cool distortion effects in the water and a Blinn Bump-mapped surface that offers a funhouse refraction of the surrounding environment. ■

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PROTECT & DESTROY

By Jason Compton

ILLUSTRATION BY MICHAEL SLACK

How to shield your most precious data from prying eyes—and how to permanently destroy your hard drive to ensure it will never, ever be resurrected by strangers.

If you think that firewall is protecting your private files from *all* prying eyes, you're living in a digital fantasyland. It may protect you from electronic intrusion by unsavory Internet interlopers, but it's doing nothing to keep your classified information from co-workers, kids, and roommates—that is, anyone who can sit down at your machine and furrow through your folders. Take heed, soldier: The real danger to your data is much closer to home than you think.

But armed with the right defensive weaponry, you can hunker down and get full-out Dale Gribble on pesky domestic busy-bodies and looky-loo G-men. Here's everything you need to know about hiding files so no one can find them, and eliminating data entirely once it's outlived its usefulness.

HIDING

It doesn't take much to squirrel away your private files. Our favorite methods include the following strategies.

MULTIPLE LOGINS

If you're a Windows NT or 2000 user, simply set up different accounts for each person who uses the computer by creating separate logins. You can do this in the Administrative Tools section of the Control Panel, in the Local Users>Groups section. Establish accounts for others that fit only in the basic Users category—reserve Administrator access for yourself. Now, using the System Tools/Shared Folders/Shares tool, make sure any folders or drives you store the good stuff on are available only to Administrators.

If you're using Windows 95/98/ME, you can also right-click any file or folder, bring up its Properties, and flag it as "hidden." Seems easy? That's because it is. But unless the other people using the machine are relative computer novices, this shouldn't be your last line of defense. That "hidden" flag can be discovered and undone by anyone who simply asks the computer to show hidden files. A more robust approach requires some outside help, such as the shareware *Encrypted Magic Folders* or *File Protector 2000* (both available from **www.download.com**), which allow you to hide individual files or folders, with password protection to back you up.

NAME-AND-EXTENSION HIJINKS

A non-intuitive name-and-extension scheme (for example, substituting .hyd for .doc) can keep people from identifying your valuable documents on sight. As long as the choices are arbitrary enough to confuse others but logical enough for you to remember, this is an easy, cheap way to deter people from opening sensitive files. Of course, you'll need to keep Windows from assigning the proper file viewer to the disguised file extension or your strategy will be ruined. Remember to periodically check the File Types tab in the Folder Options section of Explorer's View menu, lest an application start reassigning itself automatically to your file types without notification. And note that this strategy alone won't prevent people from opening your files—a smart intruder can still use hints such as file size to make an educated guess about a file's contents. The aptly named *Renamer* (download at **www.albert.nu/common.asp**) can handle batch renaming if you're looking to hide a lot of files with minimal effort.

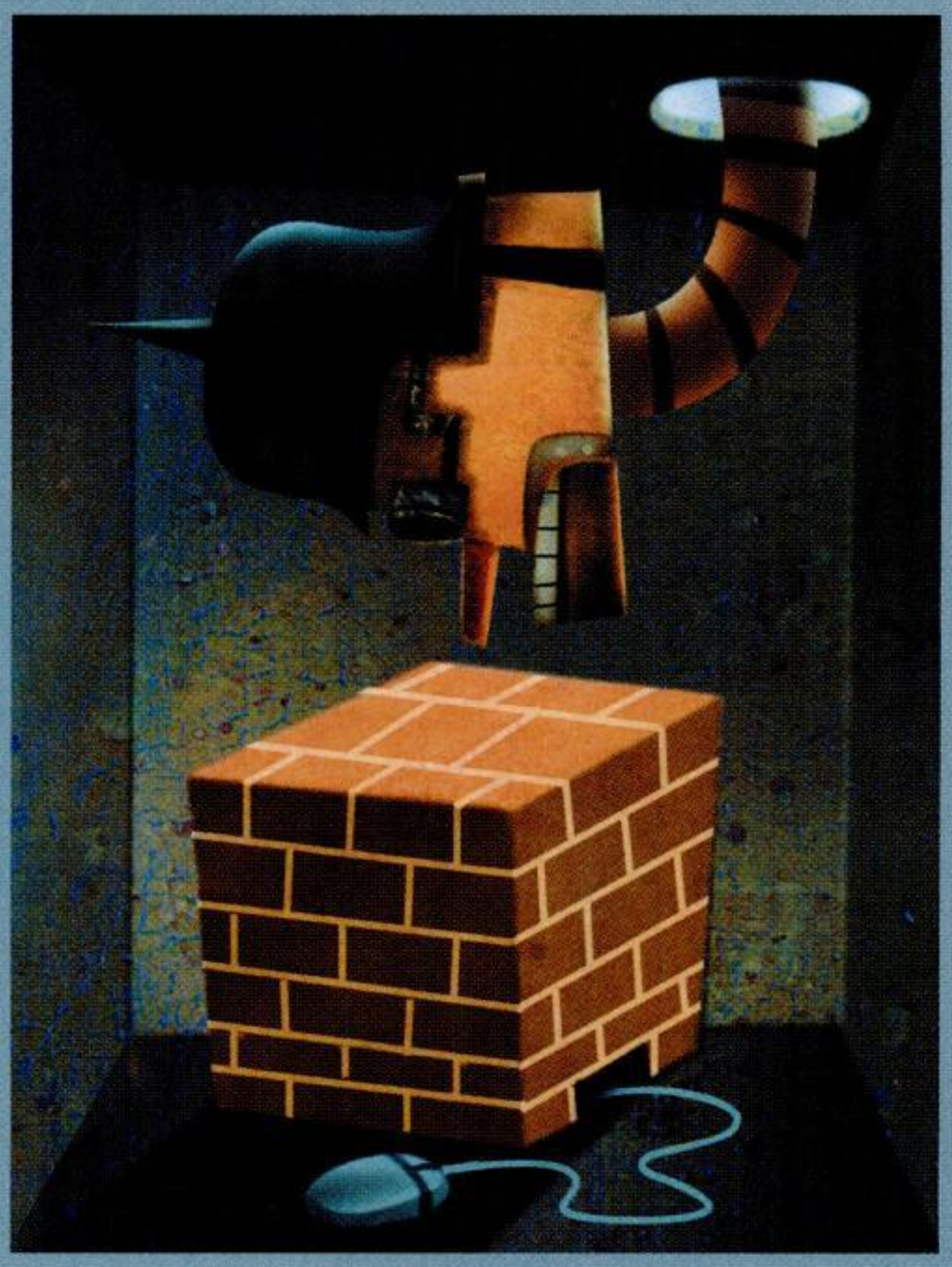
KILL THE DOCUMENTS MENU

Simply clearing out the Recent Documents tab in the Start menu goes a long way toward hiding for-your-eyes-only files. In Windows 98, you can right-click and delete items directly from the list, or browse to C:\Windows\Recent to effect some wholesale destruction. Better yet, you can eliminate the ticker entirely with a small Registry hack. Choose Run from the Start Menu, and type in REGEDIT. Open HKEY_CURRENT_USER/Software/Microsoft/Windows/CurrentVersion/Policies/Explorer. Right-click the folder and choose New>Binary Value. Name the new value "NoRecentDocsHistory"—this will kill the log. Right-click the value, choose Modify, and give it a value of 01 00 00 00. Repeat the process to create a second Binary Value with the name "NoRecent DocsMenu"—this will eliminate the entry from the Start Menu. Remember to Modify its value to 01 00 00 00.

KEEP IT OFF THE AIR

A wireless Internet setup is a pretty cool thing to have around the house—if you're not even remotely interested in keeping your private files private. Unless the wireless base and all of your computers run

a VPN (virtual private network), another wireless user can listen for your network's signature and masquerade as a valid member client. Even with a VPN, an attacker can listen for the network address transmitted by a valid computer on the network and program his card to use the same signature. *The Wall Street Journal* recently reported on a pair of benign hackers who monitored wireless traffic at Sun Microsystems and took a free ride on Nortel's WAN, and researchers at the University of Maryland have exposed wireless flaws in great detail (**www.cs.umd.edu/~waa/wireless.pdf**). Keep anything precious off a wireless network—end of story.



PROTECTING

Once you've tucked away your classified files, you'll want to ensure they stay there. Consider the following protective measures.

ENCRYPTION

If it's good enough for banks and government agencies, it's good enough for you. Encryption shifts a file's bits horribly out of order, making the file unreadable. The encryption pattern is created by feeding a "seed"—a short password, a block of text, or even a binary file—into a complex algorithm. As long as that seed is kept secret, the file is almost assuredly unintelligible to outsiders. (To shift the bits back in place, you use an encryption key accessible only to you.)

An open-source tool such as *Blowfish Advanced CS* (**http://come.to/hahn**) enables single-file encryption. Unfortunately, some single-file encryption programs don't integrate well with other programs, so you may have to manually decode files in order to read or modify them. Full-disk encryption, like that provided by *Invincible Disk* (**www.incrypt.com**), results in a major performance hit to all disk access, but its 128-bit encryption scheme is considered uncrackable with current technology.

So why do bad guys tend to get caught red-handed anyway? According to Chris Wysopal, director of R&D at security consultancy @Stake, they're no different from most folks out there in that they're actually not bothering to use encryption technologies. "We haven't had a case where we weren't able to recover deleted files or where things were actually encrypted," Wysopal says. "I don't think people understand that they can use it."

We think perhaps the proverbial good guys have familiarized themselves with the classic text *Physical Interrogation Techniques*, which, when used properly, might offer villains incentive to tell where their decryption key is stored.

HARDWARE KEYS

Encryption schemes and password-protect logins are only as good as the keyfiles and passwords that guard them. To go one step further, you might consider adding a smart card or a hardware token to the process. These devices have a small RAM chip carrying a unique signature that, in theory, can only be read by a system equipped with a matching keyfile. The keyfile decodes the signature, which authorizes users who belong to specific computers. Rainbow Technologies' USB-based iKey (**www.rainbow.com**) sells for less than $30 and integrates easily with many login and encryption-based protection schemes. And hardware tokens can't be packet-sniffed or written down and discovered. Of course, if you're the type who leaves your car keys in the ignition and locks the door, this may be a wasted exercise—losing your token can be disastrous unless you're in a situation where someone else has a master key and can issue a new one. Otherwise, you're SOL.

BIOS PASSWORDS

A password-protected BIOS requires proper authentication before the machine begins booting from a hard drive or a floppy. While this is effective in keeping people from scanning your files with investigative tools, don't forget: Unless the computer is physically secured, a devoted snoop can still remove the drive and read the data on another PC, taking your motherboard BIOS out of the equation entirely. Also, not all BIOSes offer password protection.

STAY OFF THE INTERNET!

If you don't let anyone have your files, no one will have your files. That means ensuring your secrets are nowhere near your *Gnutella* share path, or any other conduit to the net. That means never sending crucial files via e-mail, even to yourself, without encrypting them in some form. That means never putting sensitive data in the hands of an online drive service like FreeDrive or Yahoo Briefcase, which offer web-based storage space (usually 25-50 megs for free, more if you shell out some dough).

DESTROYING

That which is hidden should never be found. When your secrets have outlived their usefulness—or when you're ready to pass your old PC on to someone else—you'll need more than a simple trip to the Recycle bin. PCs have a sneaky way of holding on to the data you think you've thoroughly trashed. Does this mean that the recipients of old government machines might have access to some serious goods? Unlikely—when wiping a drive that holds even "non-critical" data, Uncle Sam writes over the drive three times: once with a character, once with its magnetic inverse (the ASCII complement), and once more with a random character. Drives holding critical data are shredded or melted down.

HISTORY IS OVERRATED

Some software is built to specifically hold on to data that's being done away with (for backup and recovery purposes). *GoBack*'s automatic recovery properties and Windows ME's built-in "tracking and recovery" service hold on to data that can speak volumes about your past computing exploits. You'll want to disable this feature of ME. Open System Properties in Control Panel. Click the Performance tab, then click File System. Click the Troubleshooting tab, and make sure the Disable System Restore box is checked.

CLEANING DIRTY DISK RESIDUE

A deleted file is not overwritten—that's why undelete and disk doctoring tools work as well as they do. When you "delete" a file, you're essentially telling the filesystem that at some point in the future it can overwrite that space. To add insult to injury, even overwriting data doesn't guarantee its demise, thanks to magnetic energy's tendency to leave the "signature" of old information underneath new information.

There are programs designed to attack this magnetic residue, including *Norton WipeInfo* (part of Norton Utilities) and the freeware *Eraser* (**www.tolvanen.com**). Both write over deleted areas of your disk with zeroes, inverses, or random data, short-circuiting Undelete attempts but leaving populated portions of the drive alone. They're far more reliable than defragmenting, which doesn't guarantee that any unused area of the disk will be overwritten.

In some cases, the Windows swapfile (a portion of the hard drive used to temporarily store transient data that won't fit into your RAM) is likely to contain intact copies of the data you were most recently viewing or editing before you powered down your machine. Until the swapfile is overwritten with new information, that's a glaring hole in your protection net. If you're a Windows 95/98 user, look for a command-line shredder such as the shareware *Scorch*, and kill the swapfile permanently by quitting to DOS before powering down. (ME users will need a DOS boot disk as well, because Microsoft has stripped Exit to DOS from that OS.) If you use Windows NT/2000, you can set the swapfile to clear automatically at the shutdown with a Registry hack. Enter REGEDIT and, in KEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager\Memory Management, right-click and choose New>REG_DWORD. Name the value "ClearPageFileAtShutdown." Right-click it, choose Modify, and give it a value of 1.

REVENGE OF LOW-LEVEL FORMATTING

If you've decided to completely do away with all your old files—because, say, you're selling your computer—a complete wipe is a good idea. Advances in drive technology have made the old low-level format process obsolete, but most drive manufacturers offer a tool that will zero out all of a drive's sectors. Western Digital calls it *Data Lifeguard*; Seagate calls it *Disk Manager*. However, if you subscribe to the belief that multiple writes are necessary to prevent spies from reading electromagnetic shadows, one low-level formatting pass won't be sufficient to put your fears to rest. On the other hand, what are the actual chances that the grandma you're selling the PC to actually has an electron microscope at her disposal?

Whether or not electron microscopes are even a credible problem is the subject of some debate. "If you really want to get at the data and you have an intact piece of media, you can perform something like an MRI and map three layers deep on most media," says Aaron Pierce, a Symantec software developer. That would mean that the previous two files stored anywhere on a drive are vulnerable, although Pierce concedes that he's never seen the process in action.

"I can't imagine wanting to have that project," adds Western Digital's Ashley Lo, senior manager in the application engineering department. "[You'd have to] reverse-engineer our drive, how our [circuitry] is controlling our heads and media, and how to descramble all the bits we put on there—even if you were able to read all the zeroes and ones, the data is scrambled one more time."

NUKE YOUR DISK

There's one way to absolutely eliminate your data—and that's to absolutely eliminate the media on which it's stored. Outright destruction of CDs with pruning shears or a controlled fire is quite effective. As for hard drives, a good drill bit straight through in four or five locations around the drive's body will wreck platters beyond recognition. Alternately, you can dismantle a drive with a Torx screwdriver (or a crowbar) and simply crack the platters with a hammer, in case Granny MRI lives down the street. ■

Data Recovery

Maybe you killed it on purpose or maybe you didn't—but what happens when you actually need to get something off a hard drive that's been thoroughly razed? We spoke with Stuart Booth, data recovery manager of Vogon International, about some of the data recovery company's toughest cases.

What's the worst drive disaster you've been able to successfully retrieve data from?

Technically, one of the worst recoveries we've dealt with was a laptop thrown from the ninth floor of a high-rise building onto the concrete below—the laptop totally disintegrated. The 12GB 2.5-inch IBM disk was bent longitudinally by approximately 5mm on each plane. By rejigging the casing and rebuilding the mechanical assemblies, then using specialized data recovery techniques and software, we were able to read all but 65 of the 24 million data sectors. The worst natural disasters have involved serious flooding—drives from a server room under four meters of effluent-loaded river water.

What's the worst drive disaster you weren't able to work around?

Disks and tapes from an industrial fire. The tapes were molten sludge, the metal head-disk assemblies had melted, and the aluminum substrated disks had completely melted. If there's no media to recover from, data recovery is a challenging feat.

How do you actually recover data from a demolished drive?

Controlled treatment of the device. We disassemble as much as possible without disassembling the parts that render the device operable, clean and neutralize corrosive agents, re-assemble the storage components into data recovery jigs, and access media at low levels using data recovery tools. We access as many blocks as possible, then specialist software engineers rebuild damaged file systems or data.

Ask the Doctor

Symptom → Diagnosis → Cure

Even the burliest of PCs comes down with a bug every now and then. That's when you need to call The Doctor and get a diagnosis that'll have you up and running in no time. Send your symptoms to: **doctor@maximumpc.com**. Unfortunately, The Doctor cannot personally respond to every individual letter.

Autorun 101

How do I write an autorun program for my CD? I have created an HTML photo album that I would like to automatically launch when the CD is inserted.

—Sgt. Stephen Bellville, USMC

If Autoplay is enabled on your PC, the first thing it does when a CD is inserted is look for a file in the root directory of the CD called autorun.inf—this file tells the PC what program to launch.

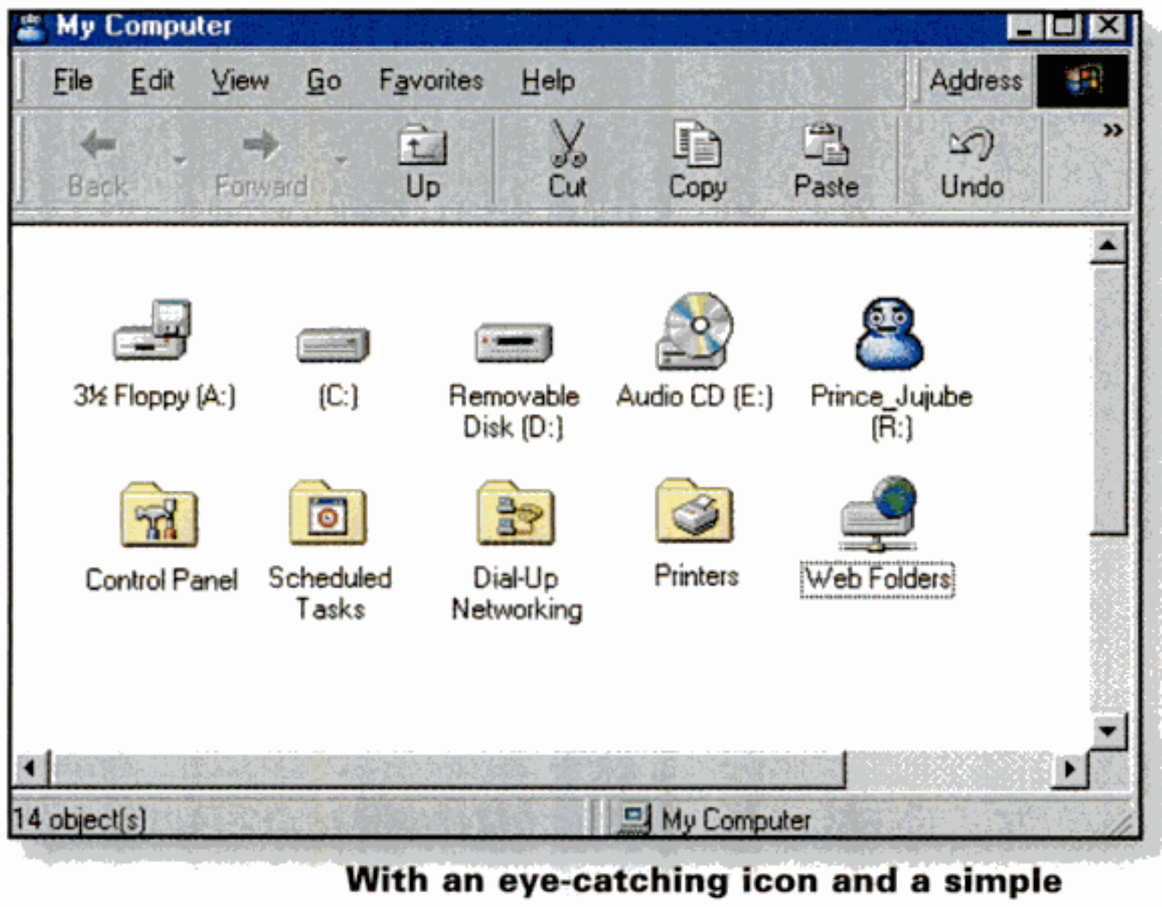
"If you do a lot of graphics work, you'll want a printer that can deliver the benefit of PostScript's advanced options and graphics capabilities."

Unfortunately, the visionaries at Microsoft never intended for autorun to launch anything but executables, so in order to launch an HTML file, you'll need to create your own executable or search shareware libraries for autorun utilities.

One of The Doctor's favorite autorun utilities is called, not surprisingly, *AutoRun*, and is available at www.tarma.com. It's small, easy to use, doesn't spray any weird files into your PC, and it's free. Just place the autorun.exe in your root directory, and open a file in Notepad and add the following lines:

```
[ autorun]
open=autorun.exe yourhtml.htm
icon=youricon.ico
```

Obviously, you'll need to enter the appropriate names for your .htm and .ico files. Save the Notepad file as "autorun.inf" and place it in the root directory of your CD, along with your custom icon and html files.



With an eye-catching icon and a simple text file, you too can get a piece of the autorun action.

There Is a Difference

I'm a bit confused about the differences among drivers for my printers. What's the difference between PCL, PostScript, and "generic" drivers? I understand that PCL comes from HP and PostScript comes from Adobe, and both deal with object representation of a document and scalable fonts. I also know that all three drivers may be installed for a single printer. But is one driver better suited than another for a certain type of document? Do I need to select a specific driver before printing, or can one driver handle all document formats?

—James Mysliwiec

Okey-doke, James, let's break it down for you. Drivers act as intermediaries between your hardware and your operating system, letting Windows know what the hardware is capable of and shuttling instructions back and forth. When you install drivers for separate printers, or a single set of drivers that happens to support multiple standards, each driver shows up as a separate printer, which you can select from the drop-down menu in the Print Setup dialog box.

PCL (printer control language), now at level 6, is generally the standard among Windows users who don't do a lot of heavy graphics and illustration work. PostScript, now at level 3, is preferred by Mac users and graphics professionals, due to its superior handling of complex graphics. Generic drivers are just that—extremely basic drivers that emphasize compatibility over functionality. Because they're intended for use among a broad range of printers, generic drivers support only the most essential printing functions, and, as such, should only be used when you have no other options. For example, generic drivers are appropriate if you've upgraded your OS only to find that your current printer driver isn't compatible and your printer company hasn't developed a fix for it, or if you can't locate a driver for an ancient printer. Using a generic driver means that you'll lose any advanced options offered by your printer.

The bottom line is that for standard business and consumer applications, PCL is fine. But if you do a lot of page layout and graphics work, you'll want a printer that can deliver the benefit of PostScript's advanced options.

Finally, be wary of PCL printers that offer PostScript emulation—this emulation tends to be a crapshoot when it comes to quality, and after busting your butt on a complex layout, you'll be peeved to discover that your printer's emulation has lost important elements in the translation.

Sluggish Startup

My PC takes forever to start up. When Windows' startup screen comes up for Windows 98, it sounds and looks like my computer isn't doing a darn thing, as if it is taking a rest or is paused. What's it doing?

—Mike McCoy

If you want to know what your computer is up to while it starts up, hit the F8 key during bootup to get the startup menu, and select "Logged." After you've booted into Windows, you'll find a file in your root directory called bootlog.txt, and inside you'll find out way more than you ever wanted to know. Nonetheless, you'll want to scan the document for anything that failed to load or returned an error message. After that, go back to the startup menu and select "Step-by-step confirmation." This will take you through each tedious step of the boot process, so you can see which step is creating the stall.

My guess is that your PC is hanging out smoking a virtual cigarette while waiting for a response from one of your installed network components. Go to Settings>Control Panel>Network and select all the network components that you don't

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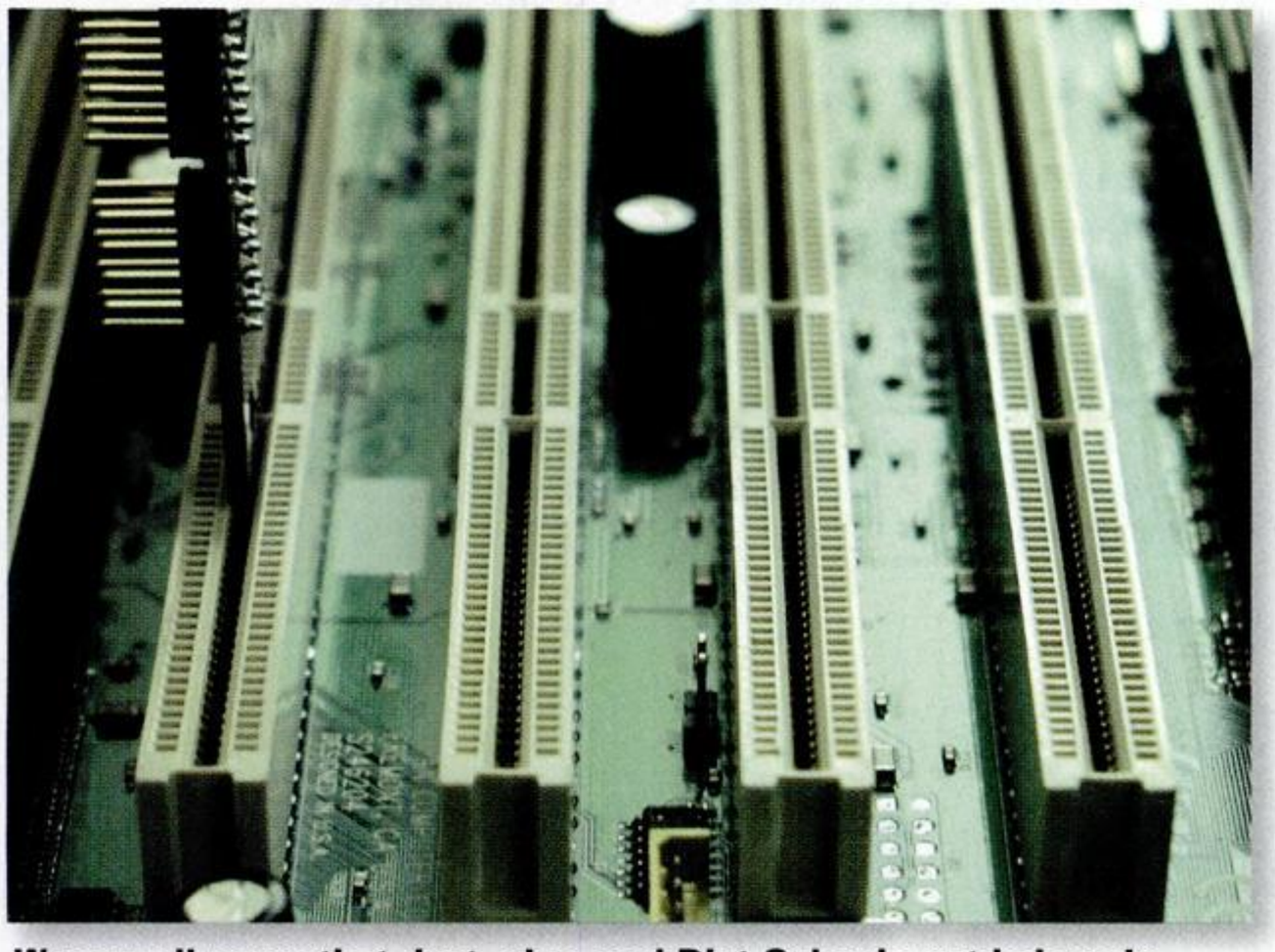

We can all agree that dust, glue, and Diet Coke do not belong in these delicate slots.

need. NetBEUI can go, as can support for IPX/SX. You can always reinstall them later. Remove these components and reboot. I think you'll find the cigarette breaks are over.

Glue Boy Strikes Again

I got my new computer yesterday, which I bought refurbished from a major company. I bought it without a soundcard or modem, so when it arrived, I opened it up and added the cards from my old machine. The first thing I noticed was that the heatsink on the videocard wasn't attached. The wires were connected, but the glue had not held, and the fan was laying on the videocard. So, being the good new computer owner that I am, I called tech support and asked the guy if I could just glue it back on. He said not to use it unattached, and that it would probably be safe to glue it back on with Super Glue.

After I glued the fan back on, I powered up the computer and nothing happened. When I removed the videocard from its slot to reseat it, I noticed that there was a drop of glue inside the slot on the motherboard. What can I do to fix the motherboard? Did the Super Glue destroy the magic smoke that makes my computer work? Am I doomed?

—Vandaal

Unless you can scrape the glue out of the AGP slot without breaking or misaligning any of the contacts, your motherboard is probably shot. Before you totally give up, try using a tiny amount of Super Glue solvent, usually available wherever you can buy Super Glue, to clean off the contacts with a cotton swab. Be very, very careful with the solvent, though, as it will do unpleasant things to whatever it touches on the motherboard.

For the record, you should have used some thermal epoxy, such as Melcor #PAL6035, instead of the Super Glue. Not only does it transmit heat better than the Super Glue, it's designed to withstand the high temperature of today's video chipsets without breaking down.

Of course, the epoxy would cause just as much damage as plain-old Super Glue if you dropped it into your AGP slot, so be more careful next time.

More Fun with Startup

A program called Sbinit.com continues to load during startup, even after I have removed it from every boot location on my PC that I can think of. I disabled it in Autoexec.bat using a REM statement, but on reboot, Sbinit.com is reinserted into the file. Aargh! I can only assume that there is some other program in the boot process which checks Autoexec.bat and reconfigures it during boot.

What sections of the Registry control the booting of programs and need to be edited? And how can I "REM" out a value in the Registry without actually deleting it?

—John McLean

Whoa! Before you start rummaging around in the Registry, let's try a less disaster-prone approach first. Sbinit.com is needed by your Sound Blaster card to implement support for DOS games. From the search-and-destroy tone of your letter, I'm assuming that you don't need this, and unless you're still stuck on the last level of *Duke Nukem*, you probably don't. Right-click My Computer, select Properties, and click the Device Manager tab. Scroll down to Creative Miscellaneous Devices, select SB16 Emulation, and click the Properties button at the bottom of the window. Select the General tab, check "Disable in this hardware profile," and click OK.

The surprise attacks from Sbinit.com are probably being launched by a file called Dosstart.bat. Do a search for this file, open it up in Notepad, and REM out the line that's launching Sbinit.com. Now delete it from your Autoexec.bat file as well, reboot, and it shouldn't trouble you any more. If this fails, however, updating your Sound Blaster drivers may take care of the problem.

The next time you go on safari to hunt down rogue startup programs, you should check out, in addition to the files available through Msconfig, the following Registry keys:

HKEY_LOCAL_MACHINE>Software>Microsoft>Windows>CurrentVersion>Run

HKEY_LOCAL_MACHINE>Software>Microsoft>Windows>CurrentVersion>Run-

HKEY_LOCAL_MACHINE>Software>Microsoft>Windows>CurrentVersion>Runonce

Additional startup applications can be found by substituting "CURRENT_USER" for "LOCAL_MACHINE."

There's no way to REM out Registry values, and that's a good thing, because there's a better way to achieve the same result without slowing down your boot with all that junk. Go to Start>Run>Regedit and select the key or branch you want to delete. Then click Registry>Export Registry File, and under Export range, click the radio button that says Selected Branch. Call it whatever you want, indicate where you want it exported to, and then click Save. After that, you can delete the Registry key, and if you ever want to replace it, all you have to do is double-click the exported key, and it'll be back where it started. ■

"There is no way to REM out Registry values, but there's a better way to achieve the same result without slowing down your boot."

How To...

A step-by-step guide to tweaking your PC experience

Your PC is a forum for personal expression—no one understands that better than the fragile psyches here at *Maximum PC*. So after taking you through the paces of painting your case in our May 01 issue, we're ready to show you how to indulge your obsessions with another custom job. This time, however, we'll be customizing Windows—your icons, Start menu, event sounds, everything.

Keep in mind that PCs are so diverse in configuration, it's virtually impossible to guarantee that every one of our tips will work the same—or even work at all—on your own PC and operating system. And don't come boo-hooing to us if you forget the three golden rules of tweaking: 1) Always evaluate the risk to your system, no matter how seemingly innocuous the tweak may be. 2) Always write down everything that you do so you can reverse the process if something goes awry. And 3) always, always back up any files that you alter.

And with that, let's get cracking...

—LOGAN DECKER

Your Startup, Wait, and Shutdown Screens

Let's start by getting rid of the tired (and, to some, offensive) Windows startup screen. Choose an image that appeals to your peculiar tastes, and open it in *Paint* (which should be hiding in your Accessories menu). Then go to Image>Attributes and type "640" in the width box and "400" in the height box. The file can't be any larger than this, so you'll have to crop, expand, or otherwise massage your image to the correct dimensions. When you're satisfied with the results, go back to Image>Attributes and change the width to 320, which will result in a squashed-looking picture. Fear not: Windows will stretch it back to 640 when the image loads. Select File>Save, and (this is crucial) select "256-color bitmap" from the "Save As Type" file listing. Finally, name your document "logo.sys" and save it in your PC's root directory. The new logo should now appear every time you start up.

Now let's move on to the other two screens. The "Please wait..." and "You are now ready to shut down..." screens, named "logow.sys" and "logos.sys," respectively, should be located in the Windows directory. If you can't find them, don't sweat it. You can still create your own. Back up the original logo files if they exist, and follow the same procedures as above, naming your new files "logow.sys" and "logos.sys" and dropping them in your Windows directory (*not* the root directory).

Ambitious interior decorators can impress their friends by heading over to **www.nucleus.com/~kmcmurdo/win95logo.html** for instructions on creating an animated startup screen.

Some caveats: WinME doesn't have the shutdown logos, and Windows 2000 dropped the startup and shutdown logos altogether.

256-color dithering took some of the gloss out of our screen captures, but we are still able to relive the ineffable magic of love every time we shut down our PC.

Completely Personalize

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Your Start Button

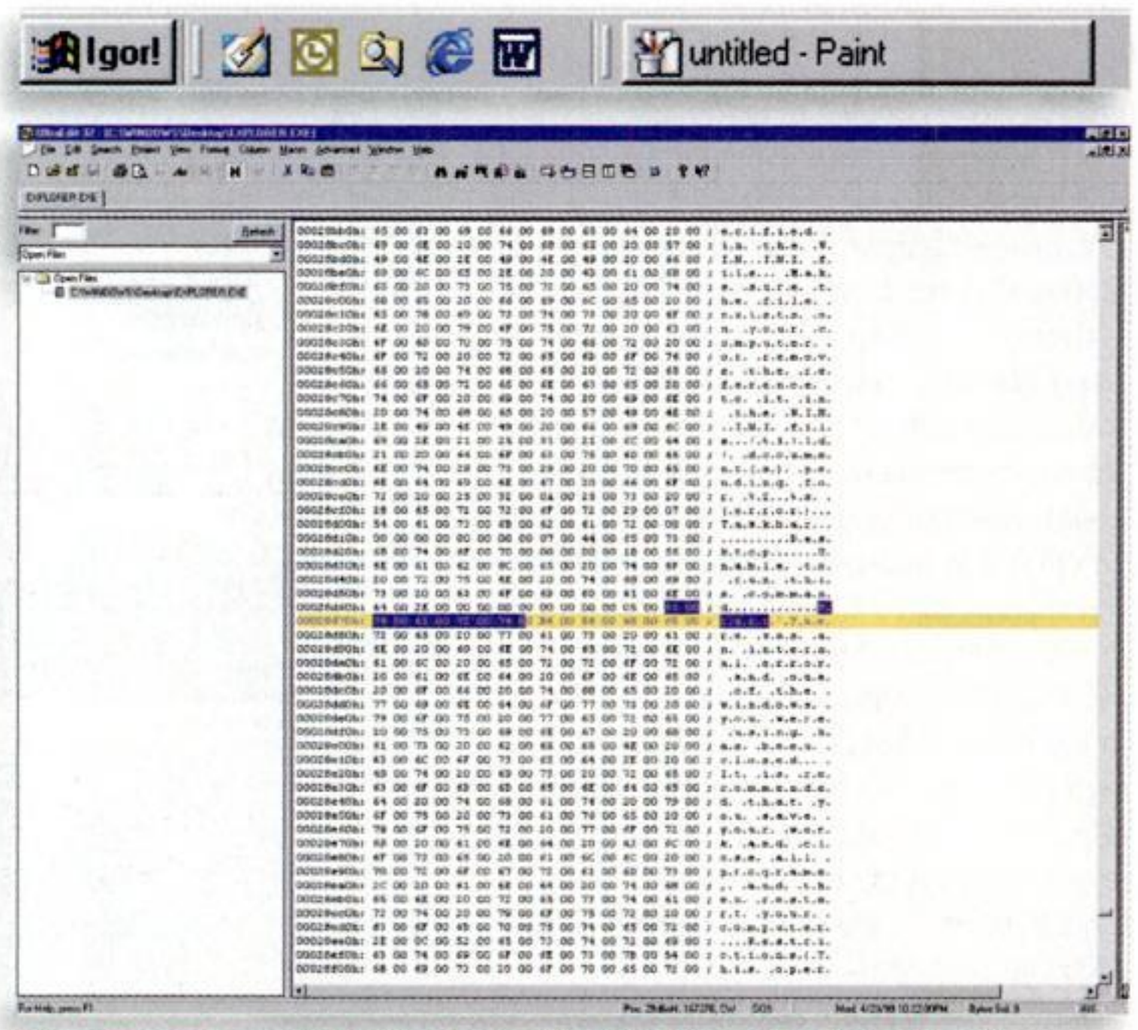
This one isn't for the faint of heart, but pulling it off will give you the same exhilarating rush that hardcore geeks get after a hack—and all without the isolation, pasty skin, and litigation hassles.

In order to change the text on the Start button, you'll need to poke around the Windows Explorer executable file with a hex editor such as *UltraEdit-32* **(www.idmcomp.com/downloads)**. Back up your explorer.exe by copying it from the Windows directory to your root directory and renaming it "explorer.old." Make another copy for editing and place it on your desktop. Start up *UltraEdit-32* and open explorer.exe from your desktop. Select Search>Find and enter "53 00 74 00 61 00 72 00 74" (which is hex code for "Start," with null characters and spaces in between each letter). Make sure all the options are unchecked, then select Find Next. *UltraEdit* will then find all instances of the word "Start" within the file and highlight them. Although the last one is usually the one that appears on the Start button, feel free to change them all. To the right of the screen you'll see the ASCII interpretation of the hex code that appears on the left. Click on the "S" in "Start" and it should start flashing blue. By clicking on each letter, but not the periods in between, you can change the text of the Start button. Your replacement text, however, must be five characters in all—no more, no less (please direct your complaints to Microsoft). When you're done, save your work and copy the file from your desktop to the root directory.

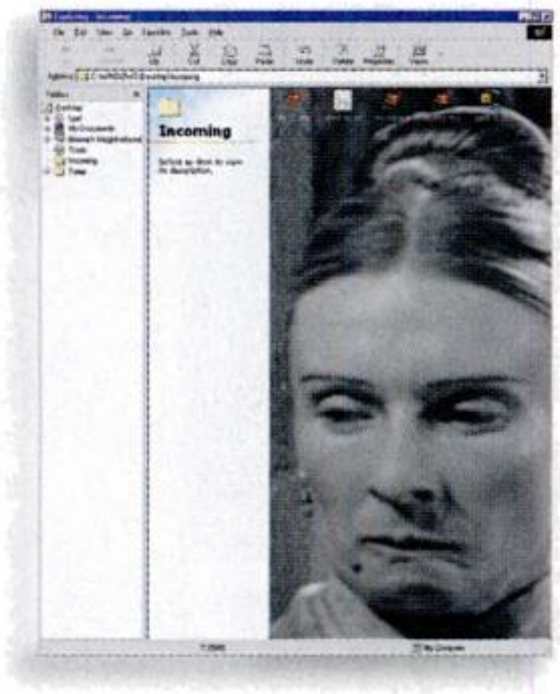
If you're using Win9x, reboot into DOS mode—a DOS window won't do. WinME users can boot from their rescue disks. Go to the root directory, and type "`del c:\windows\explorer.exe`" then "`copy explorer.exe c:\windows`"(without the quotes). Remove your rescue floppies, and reboot.

It bears repeating that any mishaps that may occur during this procedure could render Windows DOA. If you need to undo the damage, just reboot back into DOS mode and return the backup of explorer.exe to the Windows directory. (You did make one, didn't you?)

A caveat: This procedure won't work for Win2000 users, but there is an alternative method that works for *all* Windows users. Go to **http://members.fortunecity.com/rbnwares1** for a smart little program that will not only change your Start button text, but the logo as well!



You can use a scary-looking hex editor to change the text of your Windows Start button.



Your Windows

Win98 users: Go to Start>Settings>Folder Options, select Custom and click Settings. Under "View Web content in folders," select "For all folders with HTML content." From Explorer select View>Customize This Folder. Then click on "Choose a background picture." Browse for your image, which must be in bitmap format, and select Next>Finish.

As a reminder of impending deadlines, we prefer to work under the withering gaze of Frau Blucher (cue horses).

WinME users: In any Explorer window, select View>Customize This Folder and follow the prompts. Note that images will automatically tile, so ideally you'll choose an image that tiles seamlessly or, for extravagant types with lots of RAM, an image sized to run slightly smaller than the full height of your screen resolution.

Caveats: None. In fact, hardcore HTML jockeys can go crazy with this feature by selecting "Create or edit an HTML document," which permits almost unlimited customization of your folders using HTML.

Your System

ADD TO IT, ORGANIZE IT, AND CLEAN IT UP

Reprinted material

Your Icons

Budding icon creators will find no better tool than *Microangelo 5*, which can be found at **www.impactsoft.com/products/products.htm**. One of *Microangelo*'s slyest features is turning bitmap files into custom icons.

Crop your bitmap as tightly as possible using *Photoshop* or *Paint*. Then open *Microangelo Studio* and select Edit>Open Bitmap As Image (for sharper icons, experiment with adjusting the crop borders and contrast in your original bitmap). Select transparent ink by clicking the blue inkwell in the upper right corner of the palette. Now erase extraneous elements in the image. Choose File>Save and name your icon. Right-click your desktop, and select Properties>Effects. Click the icon you want to swap out and select Change Icon. Browse for the file you created and click OK.

The caveats: There's nothing to sweat here. Go wild!

Even at 32x32 pixels, those eyes still freak us out.

Your Event Sounds

Here's another one so easy, even crazed villagers can manage it. Gather a flock of WAV files. For convenience, you can move or copy these files to your Windows/Media folder. In the Control Panel, select Sounds. There you'll find lists of all system event noises, many of which, thankfully, do not have sounds already assigned to them. Click on an event, then select any WAV file to accompany it.

Some caveats: Long WAV files will not only chew up system resources, but will become aggravating faster than you can say "Blucher!" Unless you are attempting aversion therapy under the supervision of a professional, keep your samples short and sweet.

Sounds with a tiny blaring speaker next to them have preassigned WAVs, but they can be easily replaced.

Your Entire Desktop Theme

For those of you challenged with multiple obsessions, one of the best deals in the known universe is the freeware *Desktop Architect*, available at **www.desktoparchitect.com**. *Desktop Architect* allows you to package your wallpaper, sounds, icons, cursors, and appearance settings into Windows-compatible themes that can be switched on the fly. *Desktop Architect* even allows you to zip up your themes for propagation among your grateful friends.

Caveats: There's no catch. It's really free, and it works across all Windows platforms from Win95 to Win2000.

***Desktop Architect* gives you unearthly, almost omnipotent powers over your desktop.**

Resources cited in article:
www.desktoparchitect.com
www.impactsoft.com/products/products.htm
www.nucleus.com/~kmcmurdo/win95logo.html
www.idmcomp.com/downloads
http://members.fortunecity.com/rbnwares1

Additional resources:
www.tweakfiles.com
www.annoyances.org

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In the Lab

A behind-the-scenes look at Maximum PC testing

Who is this man and why is he dressed for the Academy Awards?

Moving Targets

Despite standardized testing, benchmark results sometimes get shifty

If we learned anything from your letters to the editor concerning our new benchmarking policy (**www.maximumpc.com/benchmarking/**), it's that a benchmark can tell a dramatically different story when someone makes even the smallest change to the testing procedures. Several readers boasted of leaving our *Quake III* benchmark scores in the dust—that is, until we reminded them of what detail settings we use. Suddenly, little Timmy's frame rates didn't look so remarkable.

We were also stunned at the huge difference that an application patch can make in benchmark performance. Adobe released an update for *Photoshop 6.0* in May, and we decided to see how the patch would affect benchmark scores in desktop systems. The difference was dramatic. Without the *Photoshop 6.0* patch, systems based on AMD's 1.4GHz Athlon processor outperformed systems based on Intel's 1.3GHz Pentium 4 processor by a margin of 117 percent. However, with the *Photoshop 6.0* patch, the margin dropped to 60 percent.

(A note on our use of *Photoshop 6.0*: Our *SYSmark2001* benchmark uses *Photoshop 6.0* as a component part of the test suite, and for notebook benchmarking, we use our own *Photoshop 6.0* test, which employs a custom Maximum PC action script. But neither of these benchmarks use the patched version of *Photoshop 6.0*.)

Is it unfair when a change to a benchmark affects one class of hardware differently than another? Not necessarily. PC technologies advance rapidly, and any hardware maker that's going to make it for the long haul has to prepare for constant change. Case in point: That *Photoshop 6.0* patch likely made better use of Intel's SSE instructions, thus the speed increase with Pentium 4 CPUs. But now that AMD has announced that its latest silicon will also use these instructions (see Tom Halfhill's column in QuickStart), upcoming Athlon-based systems might once again widen the *Photoshop* performance gap.

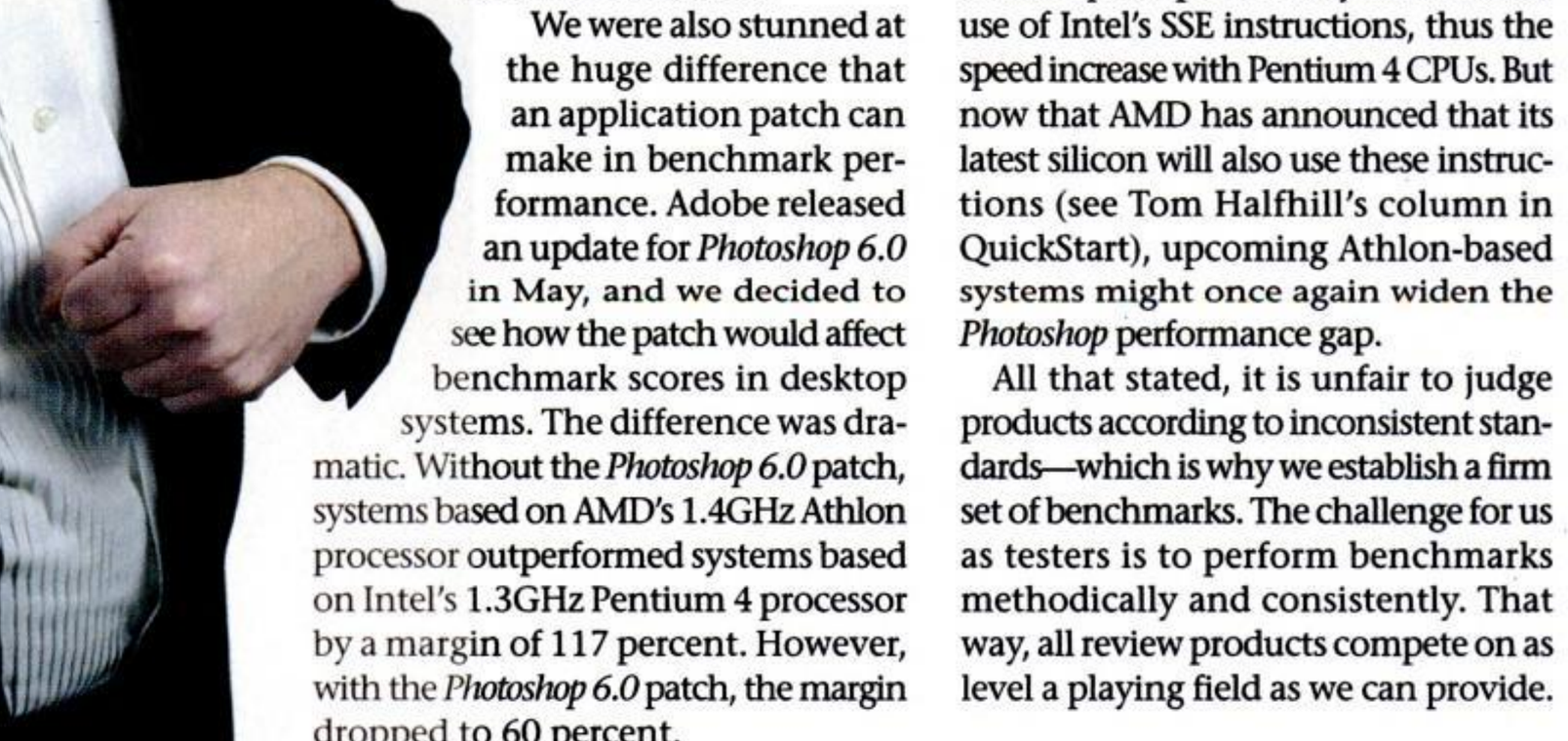
All that stated, it is unfair to judge products according to inconsistent standards—which is why we establish a firm set of benchmarks. The challenge for us as testers is to perform benchmarks methodically and consistently. That way, all review products compete on as level a playing field as we can provide.

—ROB PRATT

Geeks R Us

We're alpha-grade geeks across the board

The staff of *Maximum PC* earned top scores on the "Geek Quotient" exam in the May 01 issue. We *wrote* the quiz. From years of experience, we definitely know what constitutes geekitude. In fact, as we learned during long conversations in the Lab, many staffers have shown a proclivity for geekdom since high school—and not just for computers.



Since he's always learning show tunes for one or another orchestra gig, we can guess at Rob's geek roots.

Ed won't even think about playing a PC game if he can't get videocard performance better than 24fps.

No wonder Will howls with delight every time he crashes his test machine.

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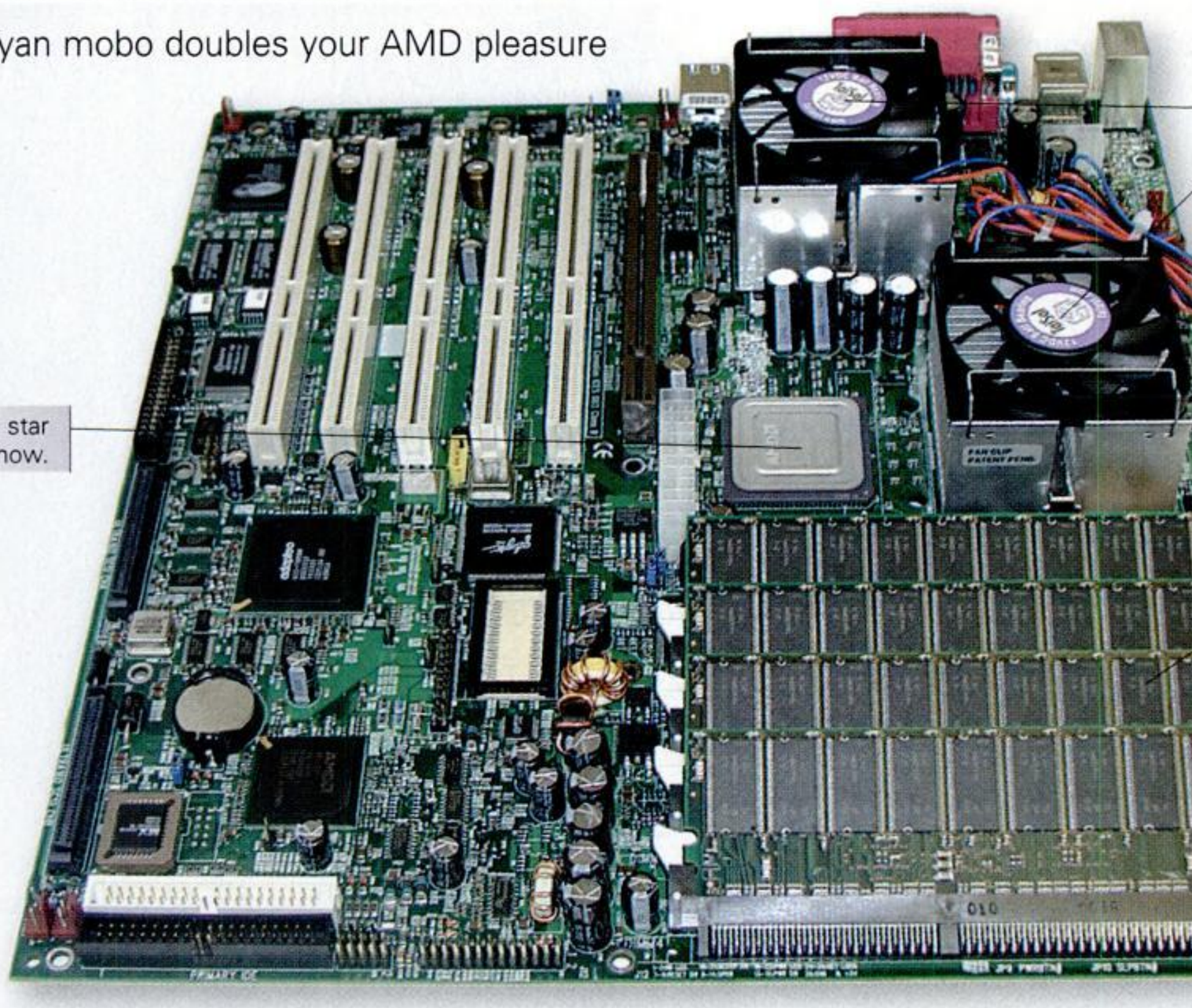
Dual Athlons Arrive!

New Tyan mobo doubles your AMD pleasure



Big-brained brothers: Dual Palomino Athlons feed the Thunder K7. Will T-birds work? Sometimes yes, sometimes no.

760MB: The star of this show.

Slide on in: This 1GB of DDR is angled at 25 degrees to allow the mobo to fit into a rack-mount.

For AMD fans, there's only one thing better than an Athlon: two Athlons. And now such multi-threading madness is ready for prime time. After weeks of speculation that AMD's dual-CPU platform might be delayed until 2002, AMD surprised many by delivering the goods.

We secured a near-final Tyan Thunder K7 board, which, for now, looks to be the first dual-Athlon board to reach market. Tyan reserves its Thunder brand for workstation and server boxes, and the Thunder K7 lives up to that heritage. This is one mofo mobo.

The Thunder K7 packs dual Socket 462 connectors, dual-channel Ultra 160 SCSI (on an Adaptec AIC-7899W controller), dual 3Com 10/100 Ethernet ports, onboard ATA/100, AGP Pro, five 64-bit/33MHz PCI slots, and four DDR DIMM slots canted at 25 degrees for rack-mount use. The real star, however, is AMD's 760MP chipset, which is the sequel to the 760 DDR chipset and—you guessed it—offers multi-processor support (two new Palomino-core Athlons are highly recommended, but two T-bird-core procs might work in a pinch).

We equipped our board with 1GB of Crucial Technologies PC2100 registered memory. The board and chipset support up to 3.5GB. Registered memory offers better data integrity, and, in fact, standard DDR memory simply won't work. Showing its server pedigree, the Thunder K7 requires a 24-pin connector and an 8-pin connector to deliver power—ATX and WTX power supplies need not apply. The Thunder K7 is also a gas guzzler. Tyan specs the board for power supplies rated no less than 460 watts.

We populated the board with two next-gen Palomino Athlons clocked at 1.2GHz and an Elsa GeForce2 Ultra videocard. We then loaded Windows 2000 Professional (SP1) on an IBM Deskstar hard drive and ran some tests.

Our new *SYSmark2001* benchmark wouldn't complete a run, so we ran the older *SYSmark2000* for comparison's sake, and the Tyan rig scored slightly lower than our Dream Machine 2000's dual 1GHz Pentium III setup. Considering that we were testing a beta board and CPUs, we won't hold the low score against the Palomino processors. (For now.) We should also note that AMD expects to debut the Palomino Athlons at 1.5GHz or 1.8GHz, not at the 1.2GHz speed we tested.

We found similar performance results in our *Inspire 3D* modeling test. The Dream Machine's dual P-III setup again outscored the dual Athlons—but that's no surprise, since *Inspire* typically runs faster on Intel silicon.

But let's forget about Intel for a moment. Our 760MP/Thunder K7 combo delivered a vast improvement in bandwidth over 760 DDR-based configurations. *SiSoft Sandra 2001*'s memory test showed a bandwidth improvement of better than 30 percent. This extra bandwidth probably came into play in our *Premiere 6.0* benchmark, where the Thunder K7 and Palominos earned the fastest score we've ever seen (143 seconds). Even though we couldn't get *Quake III Arena* to support both procs (we've had trouble with *Quake III*'s multi-processor support on other setups), we did get blazing frame rates—faster than even 1.4GHz T-bird systems with GeForce3 videocards.

Tyan hadn't set pricing on the Thunder K7 as of press time, but expect the board to set you back $550 to $750.

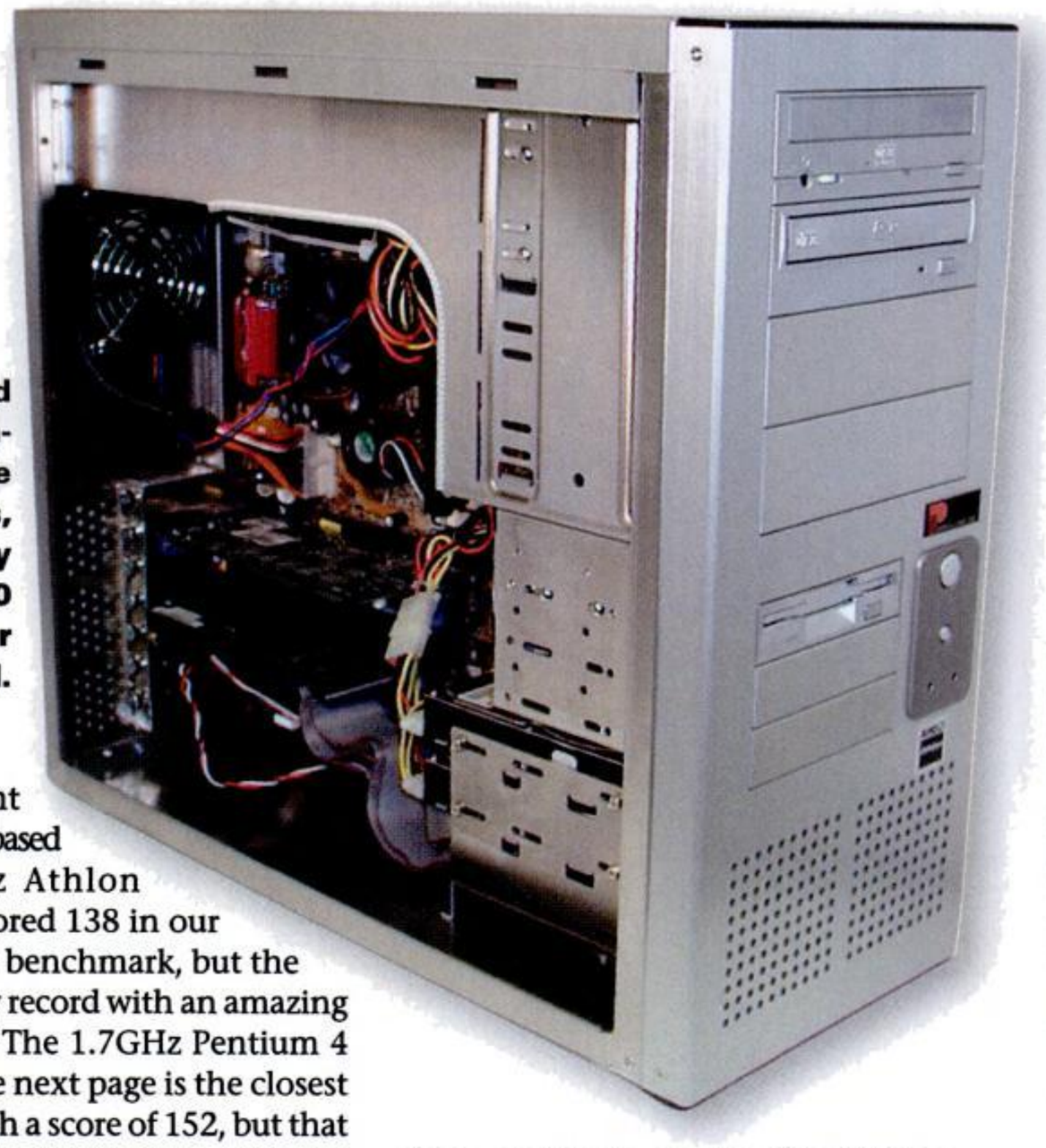
—GORDON MAH UNG

THE SPECS

SYSmark2000	230 fps
Quake III MaxPC demo	46 fps
Premiere 6.0	143 sec
Photoshop 6.0.1	61 sec
SiSoft Sandra 2001 CPU	4554
SiSoft Sandra 2001 Memory Bandwidth	913MB
Inspire 3D	114 sec

Polywell Poly 880K7-1400

AMD's latest bin jump reveals more power than expected



Stacked with high-performance components, the Poly 880K7-1400 is built for speed.

The latest chip in AMD's line of Thunderbird processors adds only a small increase in clock speed to the Athlon lineup. But when teamed with a bunch of killer case-mates in Polywell's Poly 880K7-1400, the 1.4GHz Athlon manages to deliver a power-up in performance far beyond what we'd expect from such a miniscule 66MHz boost.

UNDER THE HOOD

THE BRAINS	
CPU	AMD Athlon 1.4GHz
RAM	Two 256MB PC2100 DDR SDRAM DIMMs
I/O ports	Two USB, two FireWire two serial, one parallel, PS/2 keyboard and mouse, one gameport
DISPLAY	
Videocard	VisionTek GeForce3 64MB DDR
Monitor	monitor available but not reviewed
Video capture	Pinnacle Studio DV
STORAGE	
Hard drive	Two 40GB Western Digital Caviar, 7200rpm RAID 3Ware Escalade 6000
DVD-ROM	16x Toshiba DVD-ROM
CD-ROM	Plextor PlexWriter 16/10/40A
NETWORKING	
LAN	Realtek 10/100 Ethernet PCI card
Modem	Generic 56k PCI Win Modem
SOUND	
Soundcard	Creative Labs Sound Blaster Live! 5.1
Speakers	Cambridge Soundworks DTT2200
THE BUNDLE	

Windows 2000, *F/A-18E Super Hornet, Descent 3, MTV Sports Skateboarding, Virtual Pool 3, Star Trek Deep Space Nine: The Fallen, Icewind Dale*

BOOT: 40 sec. **DOWN: 10 sec.**

Polywell outfitted this rig for all-around speed. The system is based on Asus' A7M266 motherboard, the 1.4GHz T-Bird, and a whopping 512MB of PC2100 DDR SDRAM. The add-on components—a nice mix of content creation parts and gaming parts—are nearly untouchable as well. You get a 3Ware Escalade 6000 RAID controller, a Pinnacle Studio DV FireWire video capture card, a Sound Blaster Live! 5.1 soundcard, and the fastest videocard available, VisionTek's GeForce3. The 3Ware card gangs two Western Digital 40GB 7200rpm Caviar drives into a RAID 0 configuration for double-fast read and write speed and gobs of storage. The optical drives—Plextor's PlexWriter 16/10/40A CD-RW burner with Toshiba's 16x DVD-ROM drive—will also sate your need for speed.

All this adds up to a system that's much more powerful than the sum of its component parts. Systems based on 1.33GHz Athlon processors scored 138 in our *SYSmark2001* benchmark, but the Poly set a new record with an amazing score of 168! The 1.7GHz Pentium 4 system on the next page is the closest performer with a score of 152, but that system has a 300MHz advantage over the humble Poly. AMD should be proud that the latest T-Bird did so well, considering that the latest version of *SYSmark* would seem to favor Intel's reliance on high-bandwidth RDRAM. Of course, even the latest retooling of the *SYSmark* suite still may not be able to compensate for the P4's poor performance in basic office apps. (See our online benchmarking guide at **www.maximumpc.com** for details.)

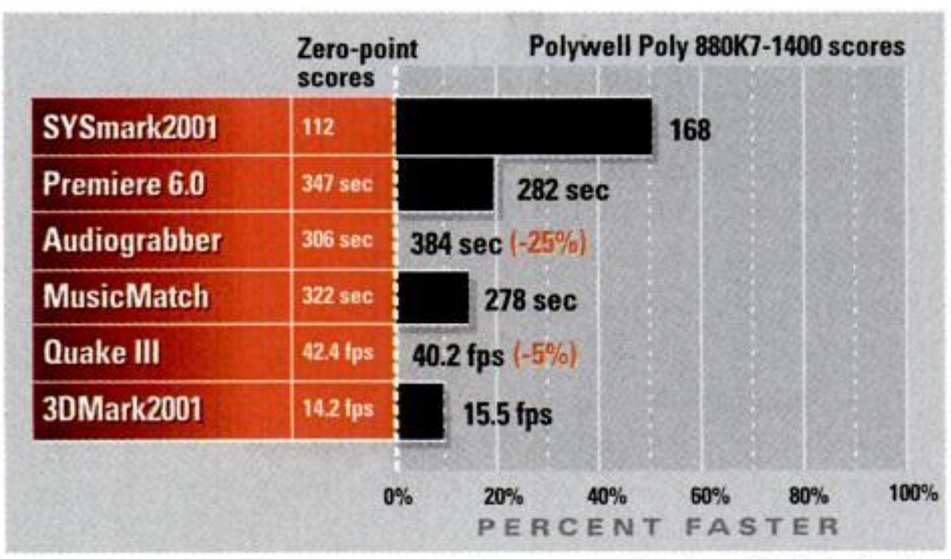
The 1.4GHz T-Bird marks the end of the line for Thunderbird Athlons—AMD's roadmap shows new Palomino-core Athies launching any day now. While this final T-bird proc *does* demonstrate a noticeable jump in power over the 1.33GHz proc, and while the entire Polywell system *does* do very well in some of our benchmarks, the processor and its host machine still can't keep pace with the multimedia capabilities of top-speed P4 systems. To wit: Athlon-based systems have dominated our *Premiere 6.0* test since we added it to our benchmark suite last month, and the Poly shaved 13 seconds off the previous top score, which was posted by a 1.33MHz Athlon system. But the P4-based Ace computer on the next page breezed past the Poly, completing the *Premiere 6.0* render-and-encode test 42 seconds faster.

The Poly also had trouble with our CD-ripping test, turning in a middling time of 376 seconds, a score 25 percent slower than our zero-point system. We suspect a system configuration error, since our tests on the PlexWriter 16/10/40A indicate that it's one of the fastest drives on the planet.

The Poly's 3D gaming scores, meanwhile, demonstrated a performance boost over similarly configured 1.33GHz Athlon systems—we saw a 10fps boost in our OpenGL *Quake III* benchmark. That's a 30 percent improvement! Not bad for a little 66MHz bin jump, eh? We didn't expect any extra speed in our *3DMark2001* DirectX 8 test because the GeForce3 boards handle the majority of intensive rendering tasks entirely on the videocard. For what it's worth, the Poly's *3DMark2001* score of 15.2fps trails only 4 percent behind the 1.7GHz P4/GeForce3 combination in the Ace system.

The Poly 880K7-1400 delivers raw processing power and plenty of performance-minded touches. It's easily the most well-honed and all-around powerful system we've seen from Polywell, and it comes in a nifty all-aluminum case from Lian Li. The end-of-line 1.4GHz T-Bird definitely delivers a performance bonus over previous Athlons, but it *is* the end of the line, and the competition's quickly getting up to speed.

—ROB PRATT



Full benchmarking details at www.maximumpc.com/benchmarking/index.html

MAXIMUM PC VERDICT

Poly 880K7-1400
POLYWELL

WHAT WE LIKE

Half a gig of DDR SDRAM and great components satisfy your need for power and speed.

WHAT WE HATE

Despite a performance bonus from such a minor clock speed boost, this is the end of the line for the T-bird Athlon proc.

PHONE 800.999.1278
www.polywell.com
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Ace Dreamedia

Intel's Pentium 4 begins to show some guts

Ace Computers' Dreamedia proves that Intel's Pentium 4 processor has multimedia prowess after all.

Give it a demo in *Quake III* and the Pentium 4 processor performs like a champ. But in other benchmarks, Intel's next-generation CPU has sometimes looked like a chump—until now, that is. The 1.7GHz P4-based Dreamedia from Ace Computers set new performance records in almost all of our benchmarks.

Intel launched the P4 at 1.5GHz in late November 2000, and the new 1.7GHz chip marks the processor's first clock-speed bump. The extra 200MHz gives the P4 a gigantic boost in video rendering as well as MP3 ripping/encoding power—and this validates Intel's claim that the Pentium 4 represents the standard for multimedia performance in desktop PCs.

The Dreamedia is based on Intel's 850GB motherboard, the freaky-fast P4, and 256MB of PC800 Direct RDRAM. This is a solid foundation of high-quality components, but, sadly, the Dreamedia includes few extras. Inside a roomy and smartly designed all-aluminum case from Lian Li, Ace outfits the Dreamedia with a 60GB 7200rpm Maxtor Fireball Plus AS, a Plextor PlexWriter 16/10/40A CD-RW burner, Pioneer's 16x DVD-ROM drive, a Sound Blaster Live! 5.1 soundcard (with an optional Live! Drive), and a VisionTek GeForce3 card. And that's it. Where's the FireWire card for image and video capture? What about a minimal RAID setup to make hard-drive storage as fast as the rest of the system?

Nonetheless, the Dreamedia provides more than enough power to blaze through all of our benchmarks. Whereas previous P4-based systems lagged in multimedia performance, the Dreamedia beats the best scores we've seen by an average of about 30 percent. And while our *Premiere 6.0* render-and-encode test showed previously reviewed P4 systems trailing Athlon systems by minutes, the Dreamedia finished in 240 seconds—a Lab record. In audio ripping, the Ace system trounced Polywell's fastest Athlon-based system (reviewed on the previous page) by more than three minutes—despite the fact that both machines use identical Plextor drives.

The only place that the Dreamedia didn't leave previous records in tatters was in *SYSmark2001*. Examining system performance in 14 common Windows apps, *SYSmark2001* strikes at the Pentium 4's Achilles' heel with a heavy workload of office productivity software. The Dreamedia posted high scores in the image-processing and media-encoding portions of *SYSmark2001*, but low performance in e-mail, database, and web browsing tasks pulled down the system's cumulative score (which we report in our benchmarking chart). The Ace system's overall *SYSmark2001* score of 152 trails the record-making 168 posted by Polywell's Poly 880K7-1400, which uses AMD's 1.4GHz T-Bird Athlon processor. Ace paired high-performance internal hardware with mediocre peripherals outside the box. The bundled NEC flat panel produces one of the crisper displays we've seen in an analog LCD, but, with loads of video power, the Dreamedia begs for a spacious CRT to show off the system's graphics glory. Also, the machine is built to rip, burn, and boom MP3s, or to double as a home theater setup, but the Sound Blaster Live! 5.1—even with the optional Live! Drive—offers only minimal audio connections. The Yamaha TSS-1 home theater speakers have great audio quality for a budget system, but a set of kick-ass Klipsch ProMedia 4.1s would give the Dreamedia audio punch that lives up to the machine's processing power.

As the first 1.7GHz P4 system we've seen, Ace's Dreamedia earns our top performance honors—not to mention a special achievement award for showing that the P4 processor has much multimedia prowess after all. But despite the gutsy hardware, the Dreamedia has few of the glorious appointments that would make it a landmark among high-performance rigs.

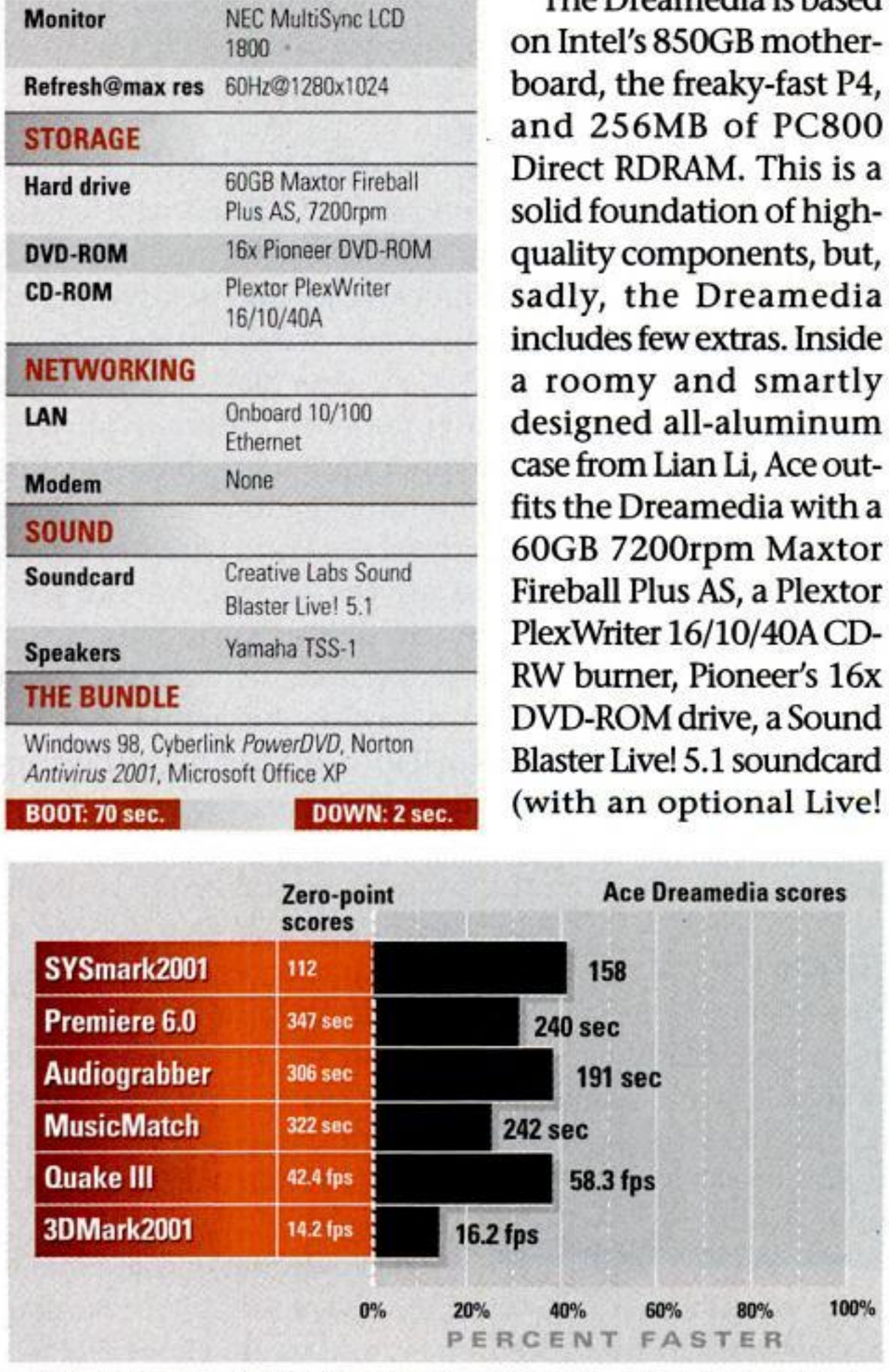
—ROB PRATT

UNDER THE HOOD

THE BRAINS	
CPU	Intel Pentium 4 1.7GHz
RAM	Two 128MB PC800 Direct RDRAM RIMMs
I/O ports	Two USB, one serial, one parallel, PS/2 keyboard and mouse
DISPLAY	
Videocard	VisionTek GeForce3 64MB DDR
Monitor	NEC MultiSync LCD 1800
Refresh@max res	60Hz@1280x1024
STORAGE	
Hard drive	60GB Maxtor Fireball Plus AS, 7200rpm
DVD-ROM	16x Pioneer DVD-ROM
CD-ROM	Plextor PlexWriter 16/10/40A
NETWORKING	
LAN	Onboard 10/100 Ethernet
Modem	None
SOUND	
Soundcard	Creative Labs Sound Blaster Live! 5.1
Speakers	Yamaha TSS-1
THE BUNDLE	

Windows 98, Cyberlink *PowerDVD*, Norton *Antivirus 2001*, Microsoft Office XP

BOOT: 70 sec. **DOWN: 2 sec.**



Full benchmarking details at www.maximumpc.com/benchmarking/index.html

MAXIMUMPC VERDICT

Dreamedia
ACE COMPUTERS

+ WHAT WE LIKE

Wow! Intel's Pentium 4 processor is really beginning to show its mettle.

– WHAT WE HATE

We can play 3D games, render video, and encode MP3s at blazing speeds, but we can't see it on a great monitor or hear it on great speakers?

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The Digi-Cam Decision

Three multi-megapixel cameras aim for amateur shutterbugs

Cover me: The sliding lens cover on Fuji's FinePix 2400Zoom means you always have protection (for your lens, that is).

Last year, manufacturers made 3-megapixel resolutions relatively common in high-end digital cameras. This year, those same manufacturers have turned their attention to "average users" with a host of new 2-megapixel models. The 2.1-megapixel CCDs used in these cameras allow a maximum resolution of 1600x1200—and they're versatile chips, indeed. They're cost-effective enough to compete with lower-priced cameras, but still boast high-enough resolutions to make quality 8x10 prints. We reviewed three "advanced amateur" cameras ranging in price from $400 to $700. These models from Fuji, Canon, and Olympus offer different feature sets, but all share a single important trait: They take great-looking pictures.

FUJIFILM FINEPIX 2400ZOOM

At $400, the FinePix 2400Zoom is the least expensive of the trio, so it's no surprise that it also has the fewest features. You get all the mid-range basics (macro mode, selectable white balance, continuous shooting, five flash modes), along with a smooth 3x optical zoom (equivalent to 39-to-113mm on a 35mm camera).

THE SPECS

	Fuji	Canon	Olympus
Zoom	3x (39-113mm)	3x (35-105mm)	3x (38-380mm)
Media	SmartMedia	CompactFlash	SmartMedia
PC connection	USB	USB	USB
Formats	JPEG	JPEG	JPEG/TIFF

While not petite, the FinePix is moderately stylish and has a sliding lens cover—which means the lens is protected and there's no cap to lose. The camera runs on four AA batteries and ships with four alkalines. We highly recommend a set of NiMH rechargeables, as the included alkalines weren't long for this world. The 8MB SmartMedia card that ships with the camera holds about 10 images at the highest-resolution/lowest-compression setting (the FinePix won't do compression lower than about 1:5). In the lowest-resolution/highest-compression mode, the 8MB card stores up to 89 shots.

Despite its respectable specs, the FinePix lags when it comes to operation. You can adjust flash settings at the touch of a button, but any other adjustment requires scrolling through a menu. The LCD monitor is the camera's weakest point. Using the LCD for composition is difficult because the display is tough to view in both bright sunlight and dim indoor lighting. The vexing menu screens and icons don't help matters, either. They're not indecipherable, mind you, and once you grow accustomed to the camera you'll do just fine. But we'd prefer a clearer interface.

In the all-important category of image quality, the FinePix is impressive. Some compositions fooled the auto-focus, but our test shots were usually sharp. Detail and color rendition were quite good. We generally don't miss highfalutin' features when our pictures look good, but we wish the FinePix was a little easier to use the first time out.

CANON POWERSHOT A20

The $500 PowerShot A20 is aimed at people who want a camera that's a little cheaper and a little bigger than Canon's popular 2-megapixel Elph. The PowerShot feels exceptionally good in the hand, thanks to a molded grip on the front right side—an ergonomic touch that doubles as the exterior of the battery compartment. This camera runs on four AAs (alkalines are included), which in part explains the camera's size difference compared to Canon's previous models (the Elph runs on more svelte lithium ion batteries). It's a trade-off, of course: AAs are cheaper and easier to find, while lithium ions are lighter and longer-lasting.

The PowerShot A20's controls are exceptionally well laid-out, which makes the camera a pleasure to use. The optical viewfinder is clear and well-positioned, and the mode dial is easy to turn and clearly marked for playback, automatic capture, manual capture, and Stitch Assist mode (for taking shots you want to stitch into a panorama). The menu is clearly labeled, and with buttons on the back of the camera, you can select continuous shooting, self-timer, macro, or landscape modes, and adjust the flash mode, exposure compensation, and white balance. Button responsiveness is particularly good.

On top of all that, the LCD monitor is quite clear, even in bright sunlight. Shooting info is easy to make out on the screen, and composing through the LCD is a cinch (albeit a battery-draining affair). The 3x optical zoom (equivalent to 35-to-105mm on a 35mm camera) is smooth and quiet, though a tad difficult to fine-tune.

MAXIMUM PC KICK ASS PRODUCT

The PowerShot's image quality was the best of the bunch. Our shots were sharp and clean, exposures were right on, and colors were accurately ren-

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Lens flair: The Olympus C-700 comes with a brawny 10x zoom—and that's not a digital embellishment.

dered. The camera's auto white balance performed credibly. On occasions when we had to adjust white balance or exposure compensation, the LCD accurately reflected our changes as we made them, so we knew just what to expect when we downloaded the images.

The A20 also offers a degree of expandability. It features lens threads that make it compatible with converters, including a new wide-angle attachment for a 24.5mm (35mm-equivalent) perspective. The camera is also compatible with a new portable dye-sub printer that can produce miniature photo-quality prints on the road.

OLYMPUS C-700 ULTRA ZOOM

A $700 price tag makes the C-700 the most expensive of the bunch. What does that extra cash get you? For starters, a 10x optical zoom. That's right, 10x as opposed to 3x. That number isn't based on any kind of digital embellishment—it's an optical zoom equivalent to 38-to-380mm in 35mm terms. While there are other 10x optical zooms on the market, none comes in a camera body as small as the C-700's. Indeed, some 10x cameras resemble small video cameras, but the C-700 is actually a little narrower than the PowerShot A20 (albeit with more lens protruding out the front).

The C-700 is based on Olympus' popular C-2020/2040 models and sports similar high-end features: programmed auto exposure, aperture-priority, shutter-priority, and manual exposure modes. It also supports spot metering, macro mode, six flash settings, and an external flash sync terminal. The C-700 also features a QuickTime movie mode, conveniently accessed by simply turning the mode dial. You can fit up to 62 seconds of 15fps video and sound on the bundled 8MB SmartMedia card.

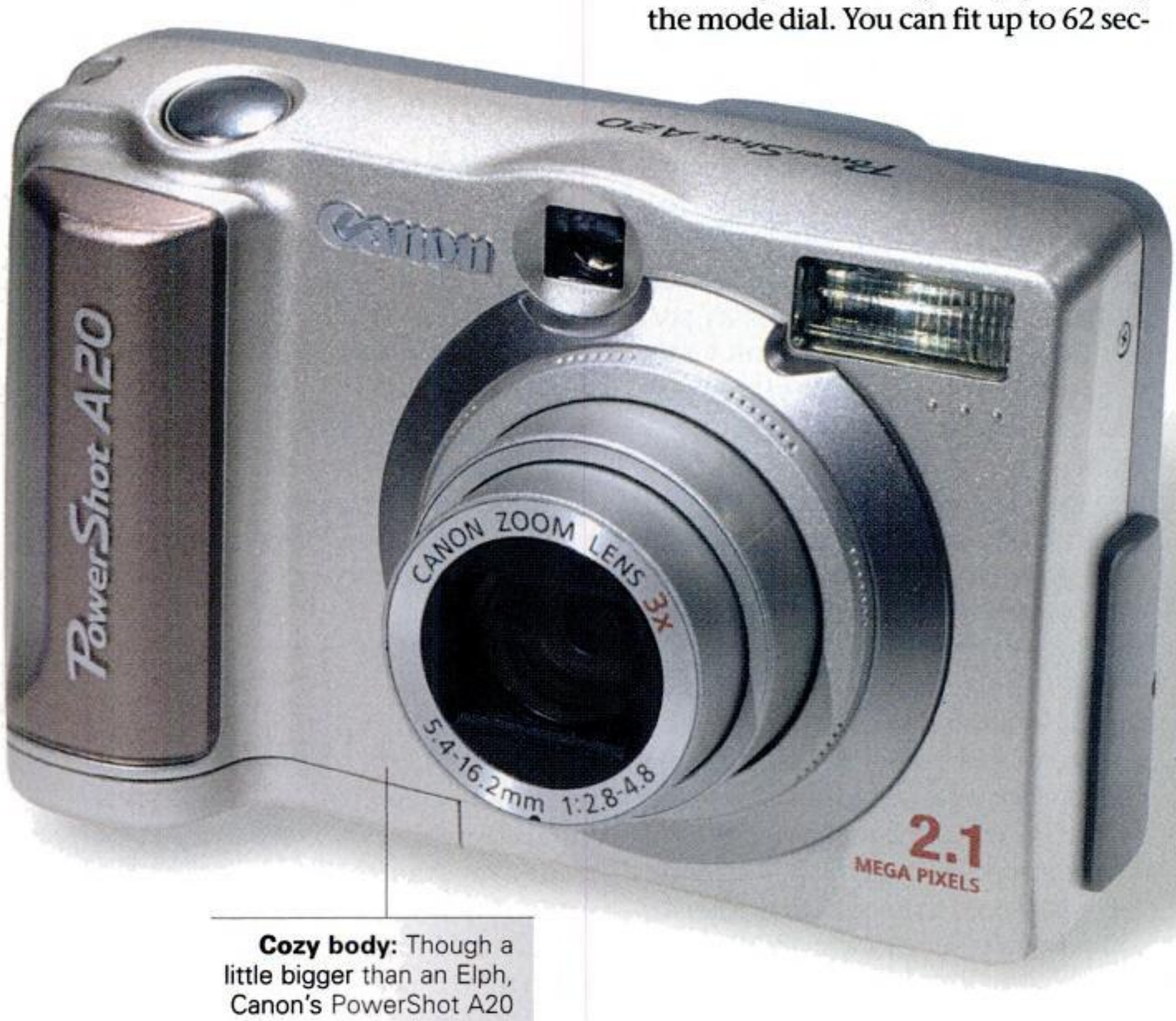
All of the modes, in addition to portrait, sports, and landscape settings, are selectable on the mode dial—a huge convenience. A number of buttons on the rear also enable selections for drive (continuous shooting, self-timer), macro mode, spot metering, flash mode, and locking auto exposure. In short, the C-700 provides all the adjustability you'd expect from a more expensive consumer camera.

The C-700 features an electronic viewfinder, which is essentially a small LCD embedded in the viewfinder window. This eliminates parallax error, but the viewfinder isn't terribly clear. Thankfully, the 1.5-inch LCD on the back is incredibly clear and bright—even better than the PowerShot's.

In terms of image quality, the C-700 produced the excellent exposures and pleasing color typical of most Olympus digital cameras. Unfortunately, it also produced a fair amount of noise (known as "digital grain") in most of the images we shot indoors. We noticed the noise in situations with and without flash, and the C-700 suffered significantly more noise than the other cameras we tested this month.

If you require extra zoom length—for outdoor, travel, or wildlife photography, for example—the C-700 is worth checking out. But based on the noise in our test images, we wouldn't recommend this camera for indoor snapshots or studio work.

—MICHAEL J. SHAPIRO



Cozy body: Though a little bigger than an Elph, Canon's PowerShot A20 feels great in the hand.

MAXIMUMPC VERDICT

FinePix 2400Zoom
FUJIFILM

+ WHAT WE LIKE
It doesn't offer a lot of extras, but the pleasing and accurate color comes at a sweet price.

– WHAT WE HATE
The LCD is dim in the best of situations, and the menus are dim-witted whatever the situation.

PHONE 800.800.3854
www.fujifilm.com
$400
8

MAXIMUMPC VERDICT

PowerShot A20
CANON

+ WHAT WE LIKE
The crystal-clear LCD lives up to the camera's crystal-clear image quality.

– WHAT WE HATE
Want to get in close for a shot? Sorry, this zoom's hard to fine-tune.

PHONE 800.652.2666
www.usa.canon.com
$500
9

MAXIMUMPC VERDICT

C-700 Ultra Zoom
OLYMPUS

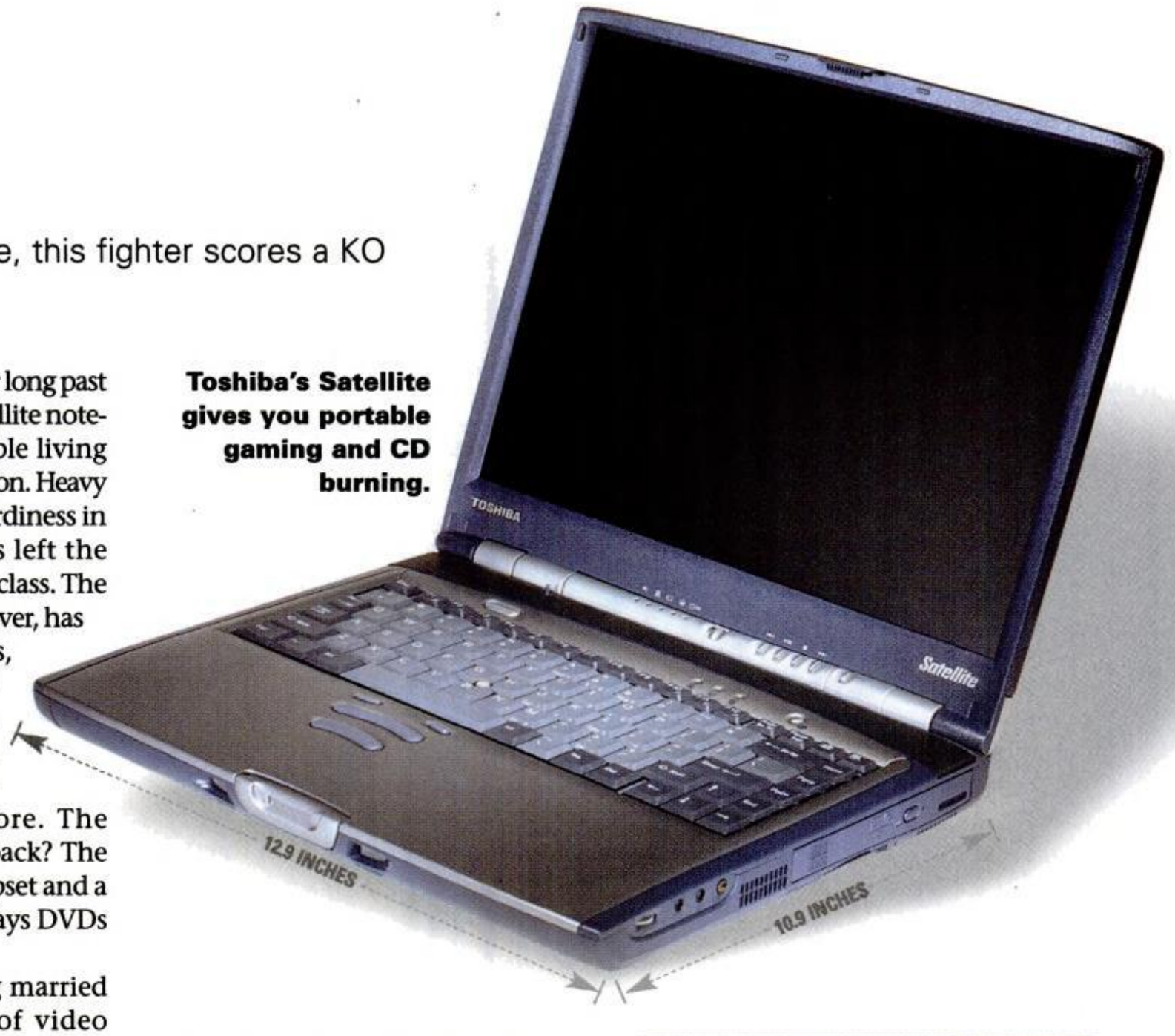
+ WHAT WE LIKE
The compact body holds a brawny 10x optical zoom and offers loads of manual adjustability.

– WHAT WE HATE
The electronic viewfinder is not very clear. Noise shows up on shots taken indoors.

PHONE 877.337.1507
olympusamerica.com
$700
8

Toshiba Satellite

With real 3D graphics and a combo drive, this fighter scores a KO



Toshiba's Satellite gives you portable gaming and CD burning.

Like a champion prizefighter long past his prime, the Toshiba Satellite notebook series has had trouble living up to its once-fearsome reputation. Heavy competition and Toshiba's tardiness in adopting new technologies left the Satellite notebooks in second class. The new Satellite 2805-S402, however, has gone George Foreman on us, proving that even old fighters can still pack a knockout punch. In fact, the new Satellite can go toe-to-toe with many notebooks that cost much more. The two keys to Toshiba's comeback? The world's fastest mobile 3D chipset and a portable combo drive that plays DVDs and burns CDs.

Despite being married to just 16MB of video memory (the Dell Inspiron notebook we reviewed last month came with 32MB), the Satellite's GeForce2 Go graphics chipset yields amazing 3D gaming, punching out 71fps in *Quake III Arena*. And because the Satellite's 15-inch diagonal display supports a native resolution of 1024x768, games running at this popular resolution look particularly crisp. (When running 1024x768 games on the Dell's native 1600x1200 resolution, pixel interpolation adds noticeable softness.)

Dell may have been the first vendor to send us a notebook with GeForce2 Go graphics, but Toshiba's Satellite lands the first blow in the combo drive arena. Toshiba's own SD-C2002 combo drive reads DVDs at 6x and CD-ROMs at 24x, and burns CD-Rs and CD-RWs at 4x. Watch DVDs on the road or burn CDs without resorting to an external CD-R drive or swapping out a drive bay. Even better, Toshiba's mobile combo drive doesn't bruise battery life. We burned a disc and still had two hours of time left on the meter.

Underneath the combo drive and I/O ports, the Satellite slyly hides a built-in SmartMedia reader. The unit also has a set of controls that play CD audio with the computer off and the lid shut. Unfortunately, Toshiba missed an opportunity to make the Satellite imminently flexible when it decided to place a permanent floppy drive in one of the notebook's drive bays. While we think floppies are valuable, we suspect most power users will use the combo drive to swap data on rewriteable CD media. We would have preferred an option to swap out the floppy for a second battery.

The Toshiba combo drive flexed its muscle in our audio extraction test with a score of 403 seconds. This beat the former notebook extraction champ (ou or Micron Transport zero-point system) by a comfortable margin of 77 seconds.

Similar speed didn't materialize in our *SYSmark2001* benchmark, which measures how well a machine performs in real-world Windows applications. The Satellite turned in a score that's about 7 percent slower than that of our zero-point notebook, even though both books use Intel's 850MHz P-III processor. Oh well, at least Toshiba managed a respectable score of 133 minutes of DVD playback time in our real-life battery test.

We still don't like Toshiba's funky mouse key layout, which forces you to over-articulate your thumb. We're also perplexed by the bass button—does it serve any purpose whatsoever? Maybe that's what they call bass in Irvine, Calif., but boyz in the 510 call that a tweeter.

In all, the Satellite is a winning comeback. It doesn't pack a super-high-resolution screen, but the Satellite is a solid portable with many features found only in much more expensive notebooks.

—GORDON MAH UNG

Get smart: The notebook doesn't have an IrDA port, but you do get a free SmartMedia reader instead.

UNDER THE HOOD

THE BRAINS	
CPU	Intel Mobile Pentium III SpeedStep 850MHz/700MHz
RAM	128MB PC100 SDRAM
I/O ports	Dual Cardbus PC Card slots, VGA, parallel, two USB 1.0, FireWire, PS/2 mouse, mic-in, line-in, headphone
Networking	V.90 modem and 10/100 Ethernet combo in Mini PCI slot
DISPLAY	
Videochip	16MB nVidia GeForce2 Go
Display	15in. XGA
Max res	1024x768, 32-bit
STORAGE	
Hard drive	Toshiba HDD 2154 20GB
DVD-CD/RW	Toshiba SD-C2002
SOUND	
Audio chip	Yamaha DS-XG
WEIGHT	
Lap weight	7.5 lbs
Carry weight	8.5 lbs
BOOT: 57 sec.	**DOWN: 3 sec.**

Full benchmarking details at www.maximumpc.com/benchmarking/index.html

MAXIMUMPC VERDICT

Satellite 2805-S402
TOSHIBA

WHAT WE LIKE

The GeForce2 Go belts out eye-watering frame rates, and the DVD-ROM/CD-R combo drive makes us weep for joy.

WHAT WE HATE

Funky mouse keys, no IrDA, a bulky power adapter, and that lame bass button pull punches on a championship comeback.

PHONE 800.867.4422
www.toshiba.com
$2,400
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MP3 Mediocrity

Sony and Rio reach for MP3 convergence, but leave us with handfuls of crap

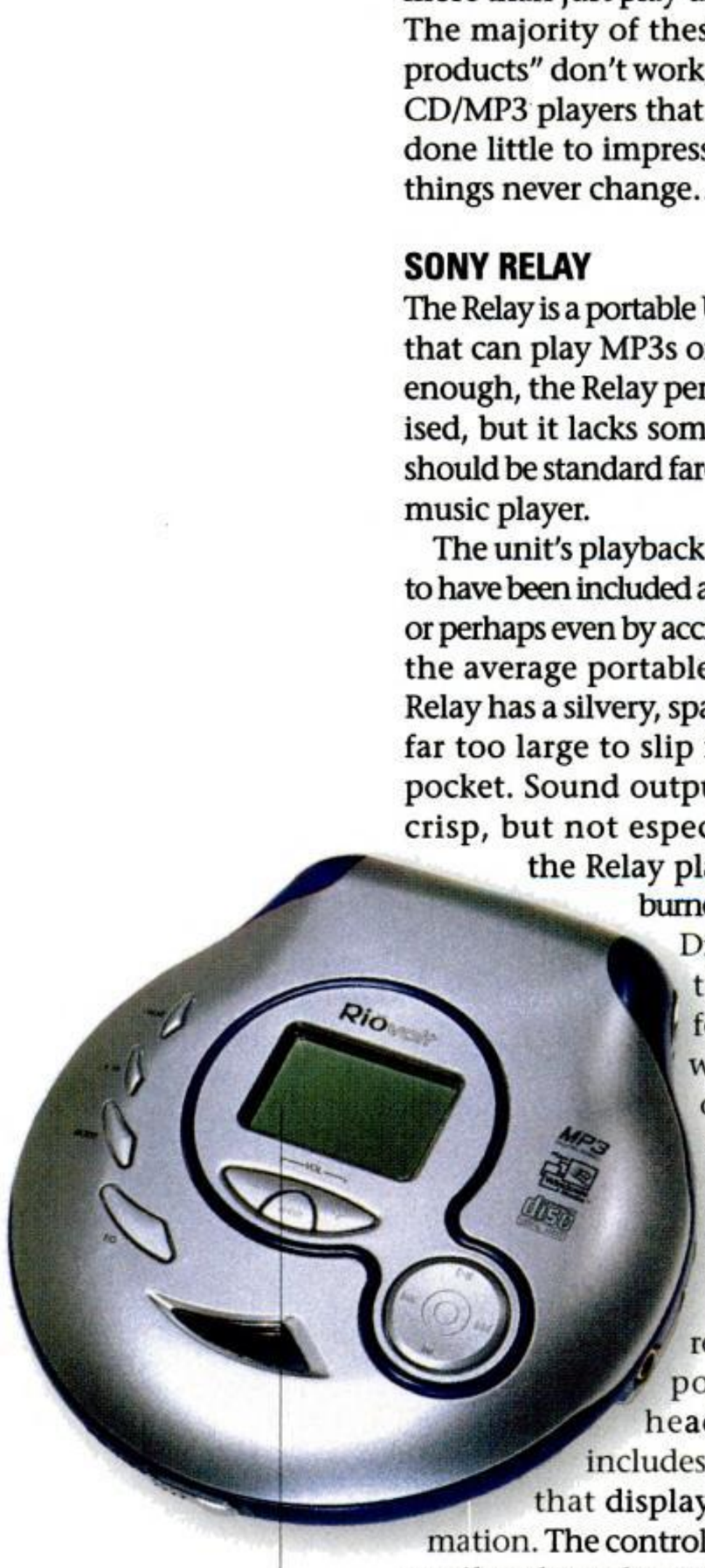
If you're familiar with our coverage of MP3 players, you know that we're wary of products that attempt to do more than just play digital music files. The majority of these "convergence products" don't work, and most of the CD/MP3 players that we've seen have done little to impress us. Sadly, some things never change...

SONY RELAY

The Relay is a portable USB CD-RW drive that can play MP3s off data CDs. Sure enough, the Relay performed as promised, but it lacks some amenities that should be standard fare for any portable music player.

The unit's playback capability seems to have been included as an afterthought, or perhaps even by accident. Larger than the average portable CD player, the Relay has a silvery, sparkly case, but it's far too large to slip into, say, a coat pocket. Sound output was loud and crisp, but not especially full. Still, the Relay played our freshly burned Tom Jones/Neil Diamond compilation CD note-for-glorious-note without a tick or a skip. You could almost hear the undies and hotel keys landing on the stage.

The Relay's remote (it's incorporated into the headphone wire) includes a scrolling LCD that displays ID3 tag information. The controls are ridiculously small and tough to operate; even the small-handed carny folk among us had trouble. Without the wired remote, you can't play music on the Relay because there is no LCD or playback control on the main unit! Now if music playback was a "value-added bonus," this wouldn't be a problem, but when you buy the Relay, you pay for MP3 capabilities. Indeed, the Relay costs $100 to $150 more than a regular-old portable CD-RW drive. Perhaps you'd be better off spending the money on two separate devices, each designed to do one thing only—and do it right.



Low voltage: It's got a fabulous formfactor and a groovy, dancing LCD, but the Rio Volt needs a little help when it comes to performing its stated function.

Although the Relay's write speeds climb to just 4x, the drive is reliable. We were able to burn CDs from three different host computers. Sony's bundled ripping software, *CD Extreme*, includes a straightforward wizard, though newbies should be warned that creating an MP3 CD means creating a data CD, not an audio CD. The software bundle includes *AbCD* (which gives the Relay drive-letter recognition and drag-and-drop capability when it's hooked to a PC) as well as *Retrospect* (a backup and recovery package).

RIO VOLT

We were predisposed to like the Rio Volt because it plays not only MP3s but also WMA files. And when we saw the Volt's big LCD screen, we got excited; no other CD/MP3 player we've seen boasts such a large display. Then we turned on the unit and saw—be still our hearts—pictures of little people dancing across the bottom of the LCD! Needless to say, we had very high hopes when we popped in our Tom Jones/Neil Diamond compilation CD.

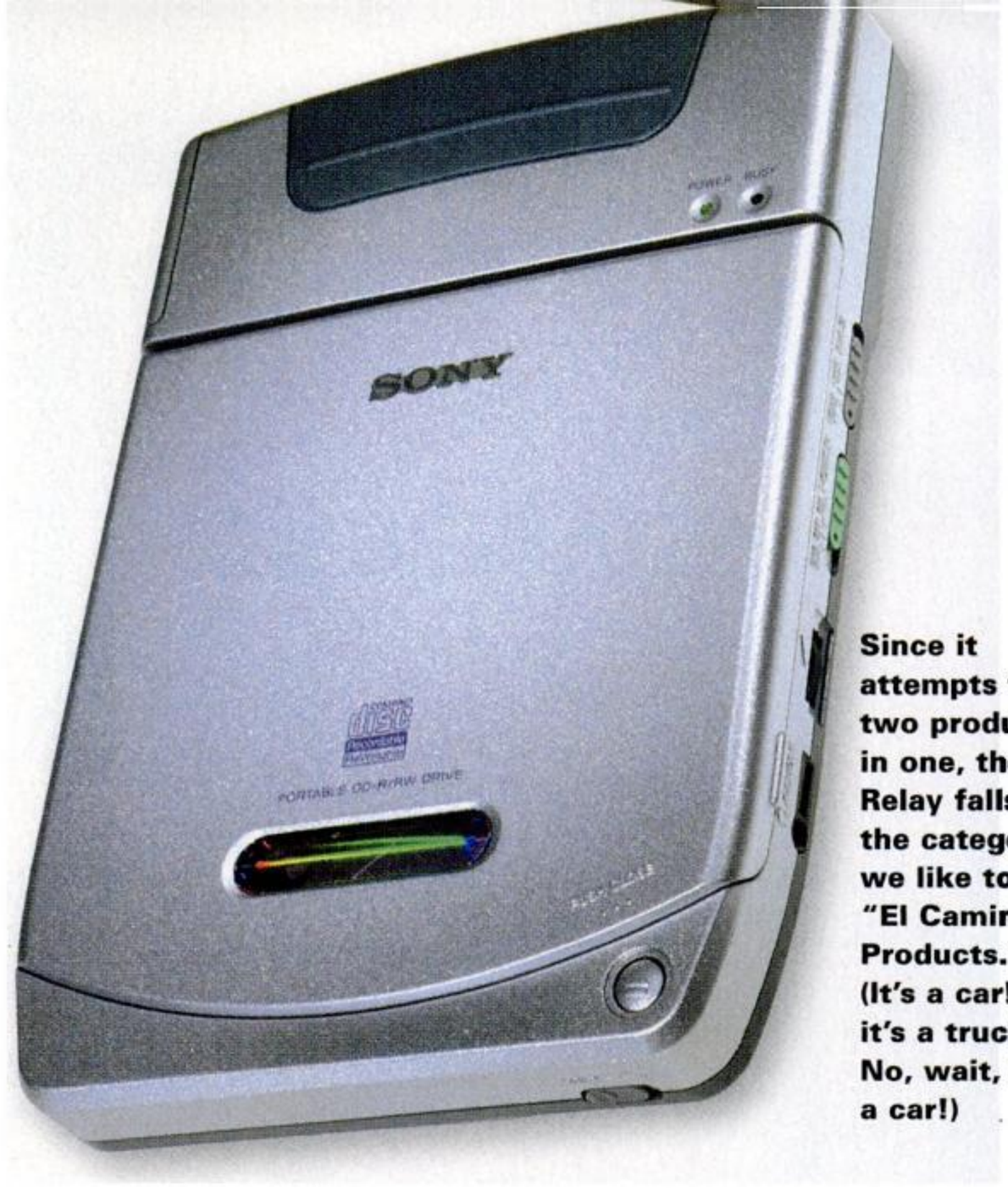
So you can imagine how crushed we were when our freshly burned CD—the same CD that played perfectly in the Sony Relay—started skipping in the middle of Neil Diamond's "Forever in Blue Jeans." Perhaps the people on the LCD aren't dancing, but are instead mocking us.

The Rio Volt offers all the standard MP3/CD-player doodads: five preset EQ settings, shuffle/repeat/repeat-all controls, and a 120-second shock buffer. The Volt lets you navigate through different directories on the CD, instead of forcing you to fast-forward through the entire CD to get to a particular song. Because it recognizes files stored in separate folders as the contents of separate directories, the Rio Volt helps you to create playlists. Just store the songs you want together in a separate folder when you burn the CD.

The included earbud headphones are passable at best, and the Volt's wired remote is pretty standard and relatively easy to use. We were intrigued by the Volt's flash upgradeability—just download the upgrade, burn it to a CD, and then play the CD in the Volt.

WMA compatibility sets it apart from all other MP3/CD players we've seen. But what of it? If the Volt can't properly play a CD full of music files, the dancing icons and flash upgradeability don't make any difference. We slapped Sony for trying to give us two products at once. Rio gets a slap for not even giving us one.

—KRISTEN SALVATORE



Since it attempts to be two products in one, the Relay falls into the category we like to call "El Camino Products." (It's a car! No, it's a truck! No, wait, it's a car!)

MAXIMUMPC VERDICT

Relay
SONY

+ WHAT WE LIKE

It's a solid little CD-RW drive, and it does, in fact, play MP3s.

– WHAT WE HATE

There's no line-out, no EQ settings, no onboard controls—and no music at all if you lose the wired remote.

PHONE 800.571.7669
www.sonystyle.com
$400
6

MAXIMUMPC VERDICT

Rio Volt
SONICBLUE

+ WHAT WE LIKE

It's shiny and blue, and watching the LCD is like turning on *Soul Train*. The +10 button makes it easy to navigate a CD full of files.

– WHAT WE HATE

That light-and-plastic-y feeling—oh, and it doesn't appear to work properly.

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$170
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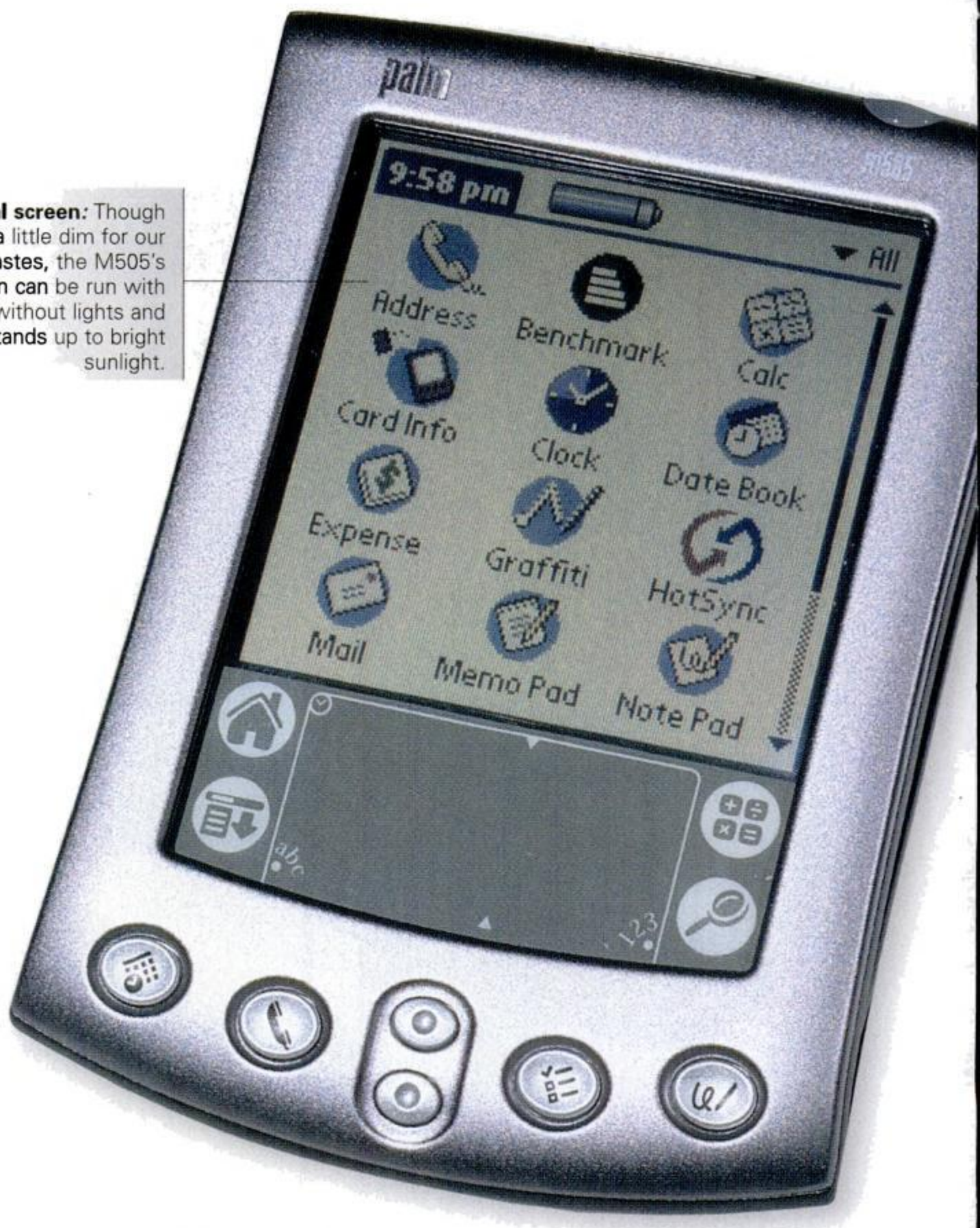
Palm M505

The best Palm yet—but that doesn't make it the best PDA ever



Dual screen: Though a little dim for our tastes, the M505's screen can be run with or without lights and stands up to bright sunlight.

Palm's new M505 gives most Palm lovers just enough new features to keep them from wandering.

When Palm Computing spun away from the institutional grip of 3Com, we expected the Palm brain trust to return to the spirit of innovation that launched the PDA phenomenon during the mid-1990s. Unfortunately, Palm's new M505 represents only an incremental improvement to existing Palm hardware. It seems as if the Palm developers have been oblivious to the recent spate of high-powered Pocket PC devices and all the consumer support they've received. Nonetheless, upgrades in the M505 are sure to please Palm partisans.

THE SPECS	
Screen res	160x160, 16-bit color
Viewable image	2.25 x 2.25 in.
Processor	33MHz Motorola Dragonball VZ
Memory	8MB
Dimensions	4.5 x 3.1 x 0.5 in.
Bundle	Palm Desktop, DataViz *Documents To Go 3.0*, *Palm Reader*, Infinity Softworks *PowerOne Personal Calculator*, MGI *PhotoSuite Mobile Edition*

The sexiest feature of the new M505 is its color screen—and it's not the same lame screen used in the Palm IIIc. The new screen shares the IIIc's 160x160 resolution, but increases color depth from 8-bit to 16-bit and employs a sidelit reflective display. This is the same screen technology found in the Compaq Ipaq's display, but the M505's screen looks slightly more reflective. And while it's not as brilliant as a backlit screen, it doesn't wash out under direct sunlight. Under diffused, fluorescent office lighting, the M505's screen is entirely legible with the sidelight turned off, but its lack of contrast makes for difficult reading in rooms with low, incandescent lighting. In zero-light situations, you can turn on a special light that illuminates your Graffiti text entry area—perfect for taking notes at night.

The most important new feature for PDA power users isn't the screen, however. The M505's memory slot works with newer Secure Digital cards as well as older MultiMedia Cards. Palm already offers preloaded applications on SD cards, and the postage stamp-size cards will eventually hit capacities in excess of 256MB.

We were initially excited about the prospect of a Palm with spacious storage, but Palm's less-than-optimal SD implementation dampened our enthusiasm. Instead of executing applications directly from the SD slot (as is the case with the HandERA 330 reviewed on the next page), the M505 and its grayscale cousin, the M500, must first copy the apps to main memory. This isn't a problem with 10K or even 90K apps, but it's a pain with larger ones. Our M505 test unit took 10 seconds to fire up a copy of *WordSmith* stored on a 32MB MMC (granted, some of the slow performance might have been due to the speed of the memory card we used). Palm says future SD cards will offer much greater bandwidth than the current generation. Even though we have nagging concerns about SD card execution, it's still cool to store a 400KB application on the card and not worry about running out of memory.

With the M505, Palm moves its PDAs to a new "universal" connector. This connector, while not compatible with the existing Palm III, VII, or V cradles, is set to be the standard for all Palms in the foreseeable future. It offers both serial and USB connectivity in one unit, but it's obviously not truly universal, since it isn't compatible with older cradles.

The rest of the tweaks in the M505 come by way of the upgraded Palm OS. Improvements in Palm OS 4 include a much-needed alarm management feature (which is complimented by a new vibrating alarm built into the hardware), mobile connectivity software, and a nifty notepad for handwritten notes and sketches. Palm bundles DataViz *Documents To Go*, *Palm Reader*, *PowerOne Calculator*, and MGI *PhotoSuite*.

The M505 is without a doubt the most expandable and powerful PDA Palm has yet delivered. But HandERA's 330 has more expandability, and Handspring's Visor Edge has more sex appeal. Get the M505 if you want memory expansion that works out of the box, and maybe for its color screen, but don't expect it to revolutionize your Palm experience.

—GORDON MAH UNG

MAXIMUMPC VERDICT

M505
PALM COMPUTING

WHAT WE LIKE
The lightest color PDA in town is also the most viewable in bright sunlight—and it lets you carry gobs of applications on SD and MMC cards.

WHAT WE HATE
All those extra applications won't execute directly from the cards.

PHONE 800.881.7256
www.palm.com
$450
8

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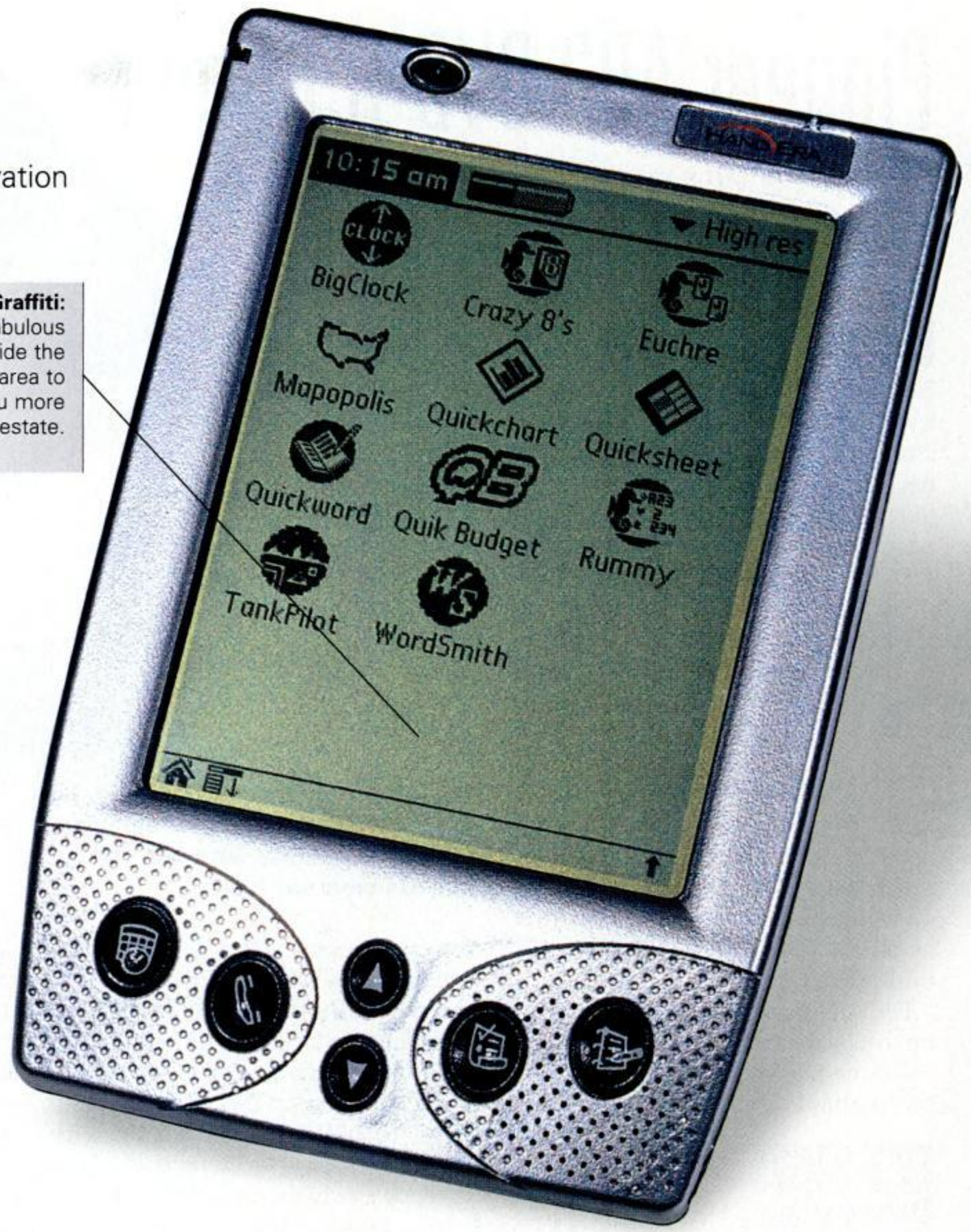
HandERA 330

Finally, a Palm OS PDA with some *real* innovation



Virtual Graffiti: HandERA's fabulous 330 lets you hide the virtual Graffiti area to give you more screen real estate.

HandERA's 330 adds a landscape display mode and a voice dictation mode.

Wake up, Palm Computing. While you've plodded along in your hardware development and slighted users who want *real* power in their PDAs, your smallest licensee, HandERA, has stepped forward to do the job right. Handspring, you'd better watch out, too. Compared to HandERA's savvy tweaks to the Palm OS, your customization job looks like a joke.

HandERA's 330 pushes the limit by adding support for both Secure Digital/MMC memory cards and CompactFlash—and, yes, you can populate both memory slots simultaneously. In testing our HandERA, we used a 32MB Type I CompactFlash card as well as a 32MB MultiMedia Card. Why two memory slots? HandERA says that people want access to mucho memory while using CompactFlash accessories such as modems and LAN cards. With the 330, you can connect to the Internet while using a large memory card. The memory slots even work with Type II CF cards, such as IBM's Microdrive. To handle the power requirements of such thirsty add-ons, the 330 fits four AAA batteries in its belly. A lithium ion battery pack is available as an option.

We liked having easy access to loads of memory, but we ran into some problems with the memory scheme. The 330 requires a downloadable utility to run applications from the memory cards. HandERA says the utility works with 90 percent of available Palm OS applications. Our testing found that the incompatible 10 percent includes the popular application *Beam Box*.

Instead of the postage stamp-size 160x160 resolution of almost every other Palm OS device, the 330 uses a 240x320 screen—the highest resolution of any Palm OS PDA. The 330 takes text input from a "virtual" Graffiti area that you can hide to make full use of the entire plot of screen real estate.

THE SPECS

Screen res	240x 320
Viewable image	2.23 x 3.0 in. 16-shade grayscale screen
Processor	33MHz Motorola Dragonball VZ
Dimensions	4.7 x 3.2 x 0.7 in.
Bundle	*Big Clock, Crazy 8s, QuickChart, QuickSheet, QuickWord, Quik Budget, Chapura Pocket Mirror, Palm Desktop 3.5*

Even cooler, the 330 can switch to a combination virtual keyboard and Graffiti area, and it can flip the entire display sideways. In high-res applications such as the bundled-in *QuickWord* and *QuickSheet*, the entire device works in landscape mode so you can view a spreadsheet or document with less scrolling.

Moving from any other Palm OS device to the 330 is like going from a 12-inch TV to a 40-inch HDTV. Since the majority of Palm applications expect a tiny, 160x160 resolution, the 330 enlarges lower resolution images to fit the larger screen. The effect doesn't always work, and we found some applications that displayed incorrectly.

Other nice touches include a voice recorder and jog dial. WAV-file audio memos can be stored in both main memory and expansion memory. The 330 doesn't play stereo or MP3s (the 33MHz Dragonball CPU doesn't have the juice for such decoding), but the 330 hides a large speaker in its front panel anyway.

Despite the 330's teething pains, we have to give HandERA credit for offering innovation on the Palm platform. For people who don't want to deal with the 330's quirks, Handspring's Visor Edge and Palm's M500 are wiser choices. For true Palm OS gearheads, however, the unit you've always waited for is finally here.

—GORDON MAH UNG

MAXIMUMPC VERDICT

330
HANDERA

+ WHAT WE LIKE

Load two flash memory cards or one memory card and one CF Type II device. Flip sideways for the highest screen res of any Palm OS PDA.

– WHAT WE HATE

The serial cradle makes for long waits when loading up all that expansion memory.

PHONE **515.252.7522**
www.handera.com
$400

9

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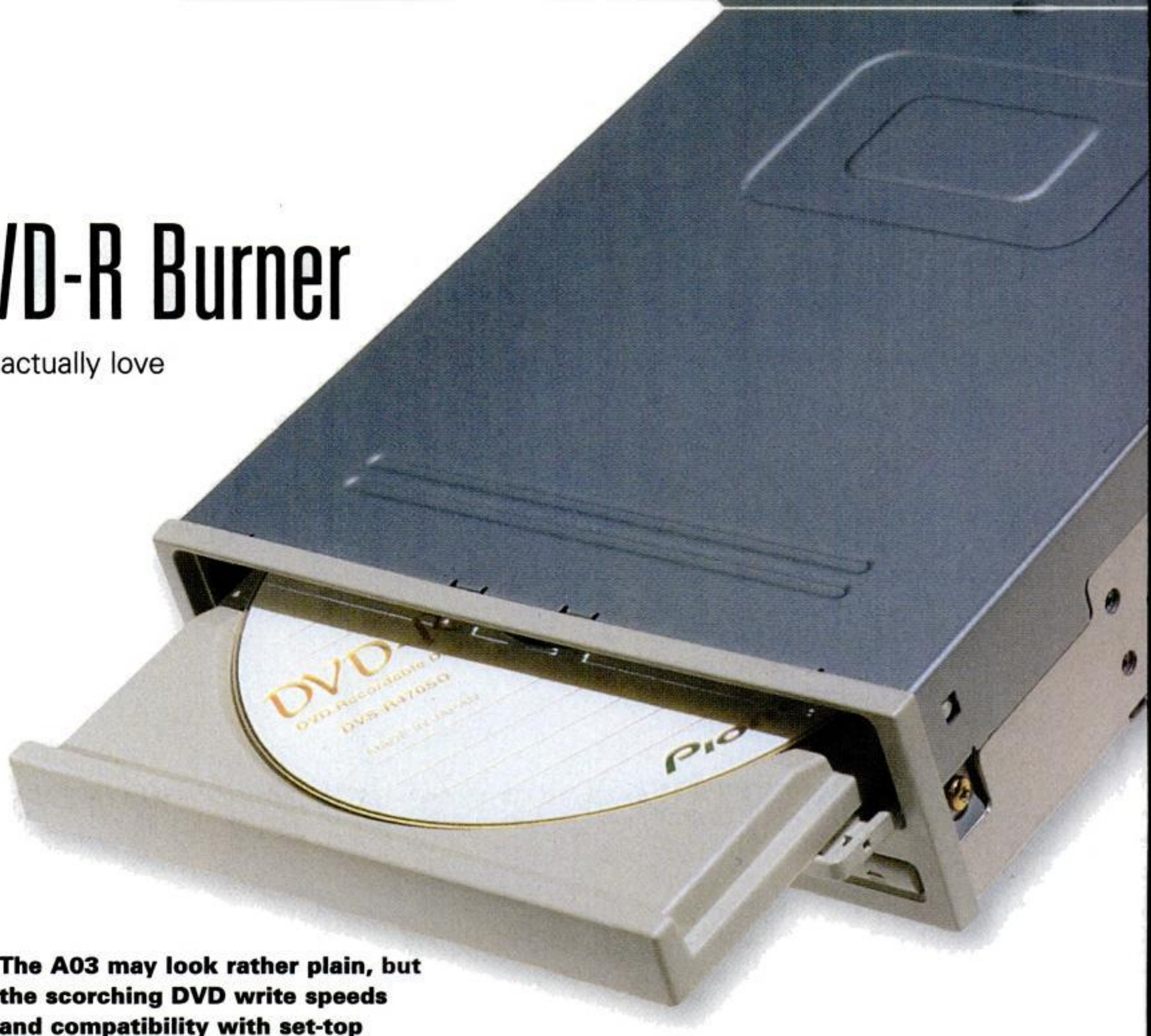
Pioneer A03 DVD-R Burner

Here's a burning sensation you'll actually love



The A03 may look rather plain, but the scorching DVD write speeds and compatibility with set-top players won our hearts.

Long-delayed during a bruising standards war over writeable DVD formats, the new DVD-R drive from Pioneer lives up to the company name—it's the very first stand-alone, consumer-level DVD-R burner. The standards battles are far from over, but the competition will be hard-pressed to match the competence, speed, and versatility of the A03, Pioneer's entry in the DVD wars.

Pioneer positions the A03 as not just a DVD burner but also an all-in-one drive with read- and write-support for the CD formats we've come to know and love. We went wild over the Pioneer DVD-R drive built into Compaq's Presario 7000 (reviewed June 01), and the retail version provides much the same functionality. The A03 also comes with a software bundle versatile and powerful enough for multimedia gurus.

DVD-R's massive storage capacity—up to a breathtaking 9.4GB on double-sided media—makes this drive a natural for hard-drive backup chores. The main attraction, however, is burning DVDs that can be played on any set-top DVD player. We assembled a DVD volume with our own digital video footage by using the bundled *DVDit!* Professional Edition. After we added nested menus, chapter stops, and a section of outtake footage, our menu- and feature-laden DVD played in every player we had in the Lab—even an ancient RCA Divx player!

RAW DATA	DVD-R	CD-R
Average data transfer (MB/sec)	2.48	2.62
Random/full-stroke seek (ms)	151/334	151/349
Audio extraction (secs)	N/A	626
Data CD burn (secs)	N/A	599
Data DVD burn (secs)	1797	N/A
CPU utilization	51%	48%

NOTE: The data CD burn benchmark uses the bundled applications to create a 620MB CD-R. The data DVD burn benchmark uses the bundled applications to create a 4.25GB DVD. For more information on how we benchmark optical drives, go to www.maximumpc.com/benchmarking/index.html.

Poke around behind the scenes, and you'll find that *DVDit!* scales gracefully with features for power users: interactive previews, looping video for menu backgrounds, and output to widescreen video and digital linear tape (DLT) masters. Astonishingly, *DVDit!* can even burn about 18 minutes of DVD video content to a CD-ROM, and it embeds its own player for PC users who lack a hardware or software DVD decoder. *DVDit!* screens files for eligible formats, but the process isn't perfect. On our test burns, *DVDit!* initially permitted our audio files, but later complained about unsupported bit rates during a tedious final build process. The program often takes long pauses when switching between tabbed menus, and occasionally our home-built menus disappeared disconcertingly, though a restart of the program restored them intact. Pioneer bundles a brawny application for CD and DVD mastering, Prassi's *PrimoDVD*, which creates DVDs compatible with UDF 1.02, Joliet, and ISO 9660 file structures.

The drive's top speed of 2x for writing DVD data is nothing to scoff at. A write speed of 2.76MB/sec means that the Pioneer DVD-R drive completes a 4.7GB disc in about 30 minutes. Building directories for DVD video and writing the lead-in and lead-out can extend this time considerably. Using *DVDit!* to convert non-MPEG video can extend this process by *days*. The DVD-R standard does not support dual-layer technology, so you'll have to flip double-sided media. But after watching 4.7GB of video, you should probably get up and walk around anyway.

Since it's an all-in-one super drive, the Pioneer couldn't shake the compromised-performance curse of combo drives. Our test results showed modest write speeds for CD-R and CD-RW media. The 2MB buffer also bothered us; the high price of DVD-R media (upward of $10 each—and that's if you get the media from Apple, packaged five for $50) means that buffer underruns quickly get costly. Despite a larger buffer and the lack of an underrun-prevention technology (like Burn Proof or JustLink, both common in CD-RW drives), we still managed to burn a flawless 4.25GB disc while simultaneously performing a heavy file-copying workload.

We'd love to see Pioneer hit a Perfect 10 by notching up the read and write speeds to reach parity with CD-RW drives, and by adding accoutrements such as a video-clip editor. But when all is said and burned, Pioneer's DVD-R drive successfully cranks out professional-level DVD video discs and delivers massive storage capacity, scorching speed, and a price that is truly revolutionary for optical media.

—LOGAN DECKER

MAXIMUMPC VERDICT

A03 DVD-R Burner
PIONEER

+ WHAT WE LIKE

Pioneer's the first with an affordable DVD burner—and its burned media even works in all the set-top boxes we tried.

– WHAT WE HATE

DVD-R media prices typically hover around $30 per disc. Also, CD-RW speeds lag behind the best CD-RW burners.

PHONE 800.421.1605
www.pioneer.com
$995

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Snap Judgements

Storage in a flash and surround soundings

Viking Intelliflash USB Flash Memory Reader

Got a lot of gadgets? Digital cameras and MP3 players have made CompactFlash cards and SmartMedia cards a permanent fixture in our lives. They've also given us a lot of USB software headaches: Connect the camera and use the camera's software to download the pictures. Now connect the MP3 player and upload tunes to it using another software package. Bah! Viking offers a solution that'll help anyone using both formats.

WHAT WE LIKE: Reads CompactFlash memory and SmartMedia cards, without error, at the same time. It's always connected to your USB port and ready to go.

WHAT WE HATE: If you use only one type of media, you don't need a reader that does both. It suffers from flimsy construction, and there's no diagram showing which way to insert a Smart Media card.

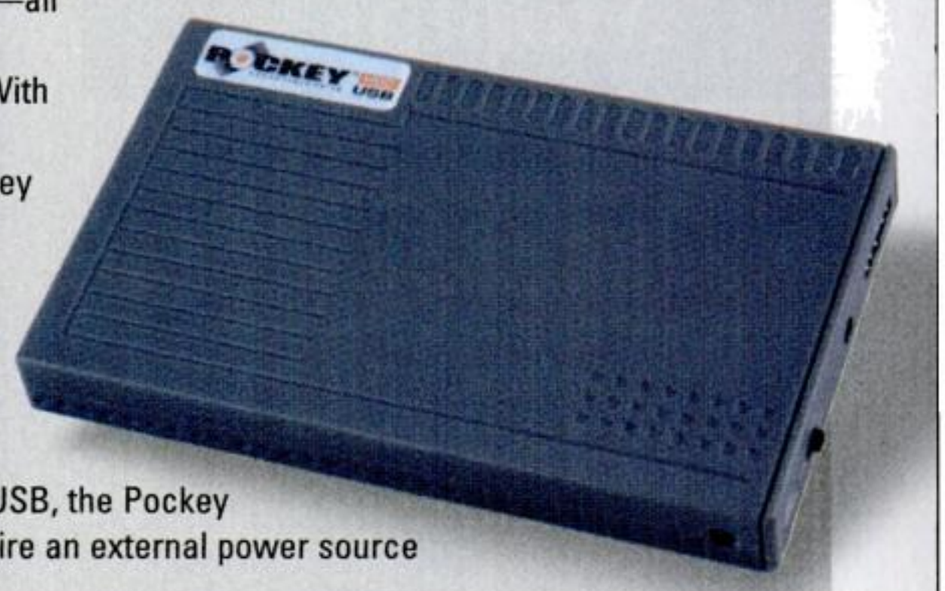
—ANDREW S. BUB

MAXIMUM PC VERDICT: 8

$60, Viking, www.vikingcomponents.com, 800.845.8777

Pockey Drive

Moving gigabytes on the fly with little fuss is critical nowadays. Fortunately, this solution fits right in your pocket. The Pockey Drive, besides having a silly name, is a portable USB hard drive designed with ease in mind. Jack it into your PC, whip in the drivers, jam in the gigabytes, and go—all without rebooting.



WHAT WE LIKE: With 10GB and 20GB versions, the Pockey Drive has enough storage space to back up virtually any important file and does so at about 120MB per minute. Since it's USB, the Pockey Drive doesn't require an external power source to operate.

WHAT WE HATE: The Pockey Drive is expensive. Speedier 60GB ATA drives can be had for the same price.

—TUAN NGUYEN

MAXIMUM PC VERDICT: 8

$320, Flotec Engineering, www.pockeydrives.com, 887.776.2539

Belkin USB BusStation

Once upon a time, the only USB peripherals to be found were a few scanners and a joystick or two. Times have changed: Nearly every PC peripheral available today comes with a USB cable, from digital cameras to printers to MP3 players. In order to make the most of those two ports on the back of your PC, you'll need some sort of USB hub. Enter the USB BusStation. In its default configuration, it's a seven-port, powered USB hub. What's all this default configuration stuff? Well, the BusStation is made up of five pieces, four modular USB hublets and a modular tower that connects them.

WHAT WE LIKE: By replacing one of the top three modules (each of which contains a single USB port), you can add anything from a USB Ethernet adapter to a SCSI adapter to another four-port hub. Pretty nifty, eh?

WHAT WE HATE: Any additional hubs that you add require their own power source, adding to the clutter of wires behind your desk.

—WILL SMITH

MAXIMUM PC VERDICT: 9

$80, Belkin, www.belkin.com, 800.223.5546 x2263

Paradigm Cinema Speakers

A set of famed Paradigm home theater speakers for gaming? Right on! At least, that's what we thought until we took them out of the box and tried to wire them to a Sound Blaster Live! card. Unlike most PC speakers, the Paradigm Cinemas don't have an amplifier built into the subwoofer or Dolby Digital decoder box. Only home theater receivers have the right connections—and you'll have to supply the cabling. But in a living-room setup, they totally rock the house. Really.

WHAT WE LIKE: Shotguns in *Counter-Strike* go KA-BOOM so loud and clear that the kitty scrambles for cover. DVD playback on a PC has never sounded more like a day at the local multiplex.

WHAT WE HATE: You have to hook them to a home theater setup or acquire a six-channel amp for your PC—any way you slice it, it's complex and costly. And the home-theater slant means they lose their crystalline imaging when placed for gaming (i.e., woofers in your face).

—ROB PRATT

MAXIMUM PC VERDICT: 6

$716, Paradigm, www.paradigm.com, 905.564.1994

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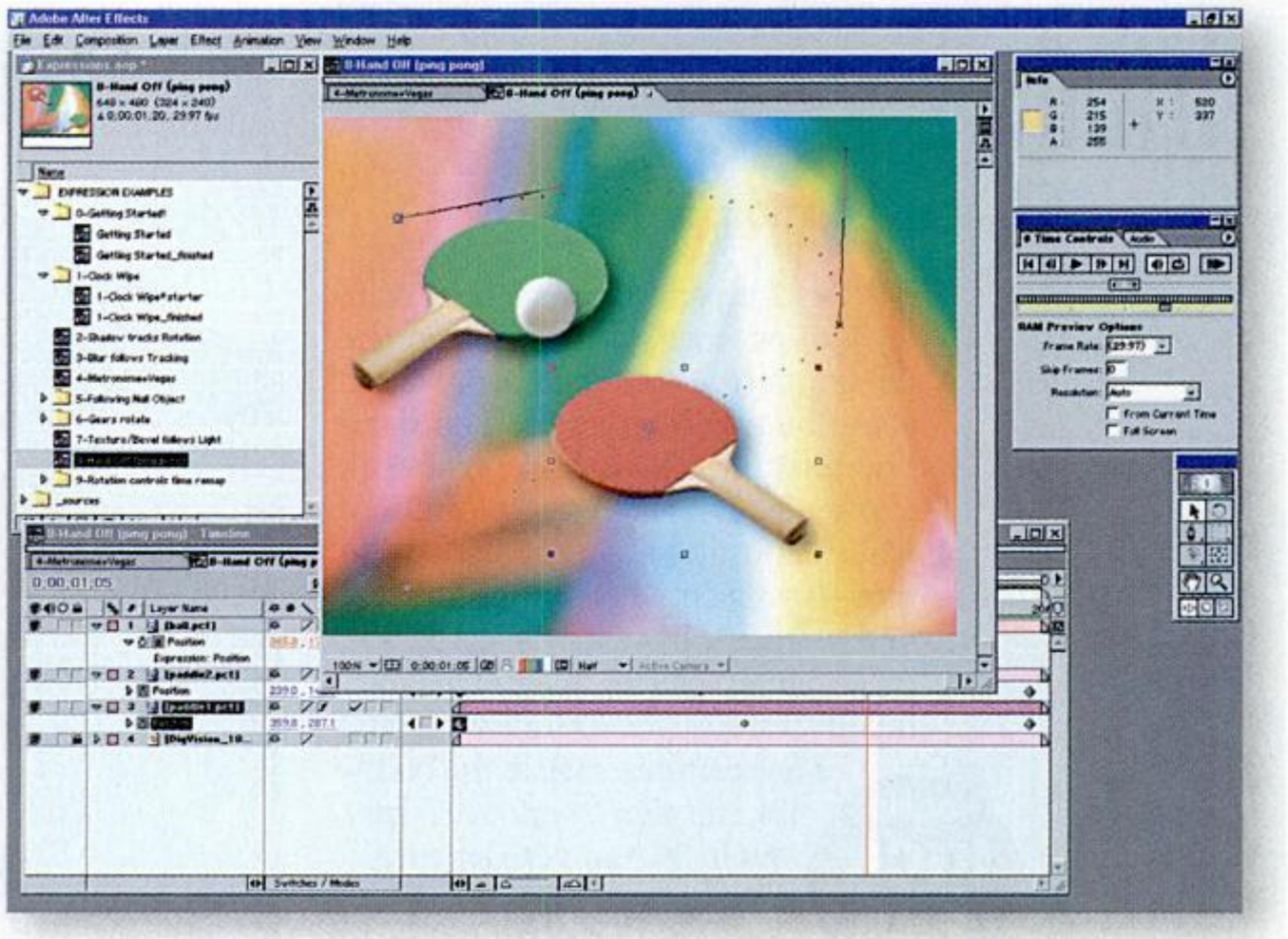
After Effects 5.0

For lovers of video eye-candy



With spline motion and the right scripting, *After Effects* enables 2D clips to simulate complex 3D animations.

Adobe's neutron bomb of digital wizardry is back. *After Effects 5.0*, the post-production companion to the *Premiere* video editing suite, adds better layer management, advanced support for 3D lighting and camera pans, and a slate of new special effects.

Just by its nature, *After Effects* is complicated—there's just no easy way to represent several layers of streaming video, graphics clips, and special effects on a flat, static display. The sometimes-too-informative Adobe timeline is still the best interface for managing the chaos, but the maddeningly small icons and controls will cramp your style until they become familiar.

Layers (which can be a static frame, a video stream, or a small art object) can be toggled between visible and wireframe modes, which can help make sense of an effect or compositing setting that doesn't look quite right the first time around. Any layer can be set in a 3D space, where you can implement free rotation, as well as unique lighting properties and camera settings. The camera settings alone are impressive and can replicate the effects of small, distorted lenses or 70mm professional rigs. If *After Effects*' built-in effects options seem insufficient, you can always roll your own by writing a script. *AE* uses JavaScript 1.2 and includes a cursory primer in the online Help.

The Production Bundle edition of *AE* adds a number of slick organic special effects, including a fractal noise generator (good for creating textures) and a mesh warp tool that allows objects to be stretched and mangled at will. If 24-bit video (8 bits per color channel) seems too limiting, the Production Bundle's 16 bits per color channel should come in handy for outputting projects to film or high-resolution digital formats.

In addition to the sundry bonus effects and a vector drawing tool that can replace Adobe *Illustrator* in a pinch, the Production Bundle includes a distributed render engine that can be legally installed on any number of networked computers to assist in long processing tasks. Your "helper" computers can be slower than your main *After Effects* box, but should still be relatively beefy or the performance hit in managing the network render will outweigh any benefits of distributed processing.

Once *AE* has worked its magic, the finished product can be output back to a sequence of frames (which is appropriate if you need to do further editing). You can also output to AVI and QuickTime, as well as a DV stream and uncompressed NTSC and PAL video. The new *AE* can also build Flash animations natively. Widescreen and high-res (D4/D16) video are supported, which is crucial during the transition period from classic consoles to HDTVs. Notably absent is direct MPEG1/2 output support, although there are plenty of other tools that will build MPEGs from frames.

AE5 has an incredible menu of features, and once you've mastered the intimidating timeline, dropping complex effects into an animation or video clip is considerably easier than it would be in a paint package. However, packages such as *CorelDraw!* and *Photoshop* can automate and animate their own special effects, so if you simply need to apply motion blur or color correction to a sequence of frames every now and then, *After Effects* is complete overkill, especially at the price.

—JASON COMPTON

Instant crowd pleasers, like animated lightning, are extremely easy to add to a video stream.

MAXIMUM PC VERDICT

After Effects 5.0
ADOBE

WHAT WE LIKE

Includes tools for all things visual. Great on-the-fly and preview rendering keeps you working instead of waiting.

WHAT WE HATE

Timeline editor has a steep learning curve. And even the standard edition has a steep price.

PHONE 888.724.4508
www.adobe.com
$1,500

9

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Tribes 2

If you only buy one game this year...

Gear up: Armor options let players bulk up for heavy-duty assault or travel light for sneaking around in enemy territory.

Tribes 2 is perfection in a box. Yeah, I know what you heard. You were online and someone complained about bugs and server problems and how he wants his $40 back because it's a rotten game. That guy—please wait while I consult *Roget's* for a good epithet—is a frigging idiot. During the week of the *Tribes 2* launch, players experienced server problems. Some of the community features weren't functional, and a few features, such as the buddy list, still didn't work weeks later. But in 30 hours of gameplay, I experienced maybe a dozen lock-ups, and that's not sufficient grounds to call Ralph Nader. Deal with it and move on, and you'll experience the single best reason for the Internet to exist. Aside from porn.

MAXIMUM PC KICK ASS PRODUCT

Tribes 2 is a multiplayer action game that takes the team-play model to remarkable heights. The initial *Tribes* was a boutique game beloved by a small band of fans. It covered similar multiplayer action territory, but many gamers shunned it because of its lackluster visuals. *Tribes 2* takes care of that and hones game elements to a killing edge. This is unmistakable action gaming with a depth and complexity that redefines the genre. Multiplayer to the bone, *Tribes 2* has a just-passable single-player mode that features tutorials and decent bot play.

The appeal of *T2* lies in its radical diversity—if you tire of one play mode, you can simply turn to another and the entire experience becomes fresh again. In Hunters mode, you collect flags from fallen foes and deliver them for points. In Rabbit mode, you join everyone else in hunting a single designated player. In Siege mode, you help your team take a position or fend off attackers. And you already know how a conventional death match works.

Judging by server traffic, capture-the-flag is the big-ticket draw. It's also where team-play elements come to life. *T2* involves more than just running around and capturing flags. Players can deploy complex defensive elements, such as turrets and sensor webs. Transports, bombers, fighters, tanks, and grav cycles are tough to master but vital to certain maps. The three types of armor (light, medium, and heavy) have weapons and strengths exclusive to each. With them, you define a specific role in a CTF session—the invisible sneak, the long-range sniper, the all-purpose warrior, the heavy-weapons dude, or any combination you can invent. Some people choose to spend entire sessions setting up defenses, healing others, performing bombing runs, or taking on other specific tasks.

The visuals are amazing, the maps are huge and detailed, and the mechanics are buttery smooth—but we expect that by now. Players have just started to tap the in-game mail, news, forums, chat, and tribe-creation elements. These features will help *Tribes 2* grow into a thriving, dynamic online action-gaming community. Loaded with elements to ensure diverse experiences, *Tribes 2* will remain incredibly fresh. It's an always amazing, consistently surprising, undeniably addictive, and truly refreshing experience. Religions have been founded on lesser epiphanies.

—THOMAS MCDONALD

New in *Tribes 2*, vehicles like the Thundersword bomber pictured here let players dedicate themselves to highly specific roles, including pilot or tail gunner.

MAXIMUM PC VERDICT

Tribes 2
SIERRA/DYNAMIX

WHAT WE LIKE

Top-notch production values deliver both large and detailed worlds and extensive gameplay choices.

WHAT WE HATE

Many features didn't work at first—some *still* don't. But none of them are deal-breakers.

PHONE 800.757.7707
www.tribes2.com
$49

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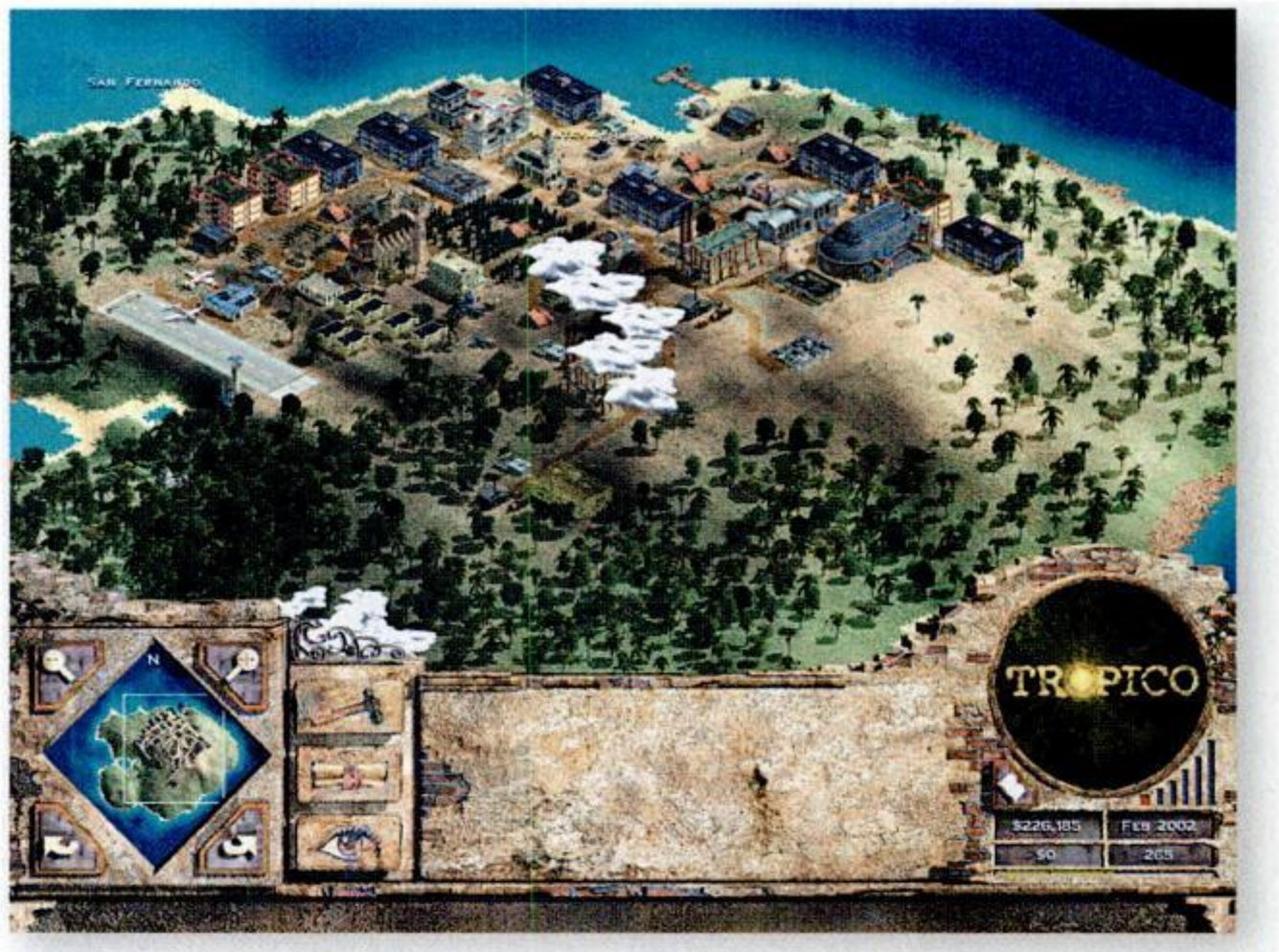
Tropico

Benevolent dictator or total tyrant—as El Jefe, you decide



Caribbean paradise or tropical tyranny? You decide whether to let your citizens live under a democracy or a dictatorship.

After the success of *Railroad Tycoon II*, Poptop Software CEO Phil Steinmeyer turned for inspiration to one of his all-time favorites, Paragon Software's 1987 *Hidden Agenda*. But Poptop's latest, *Tropico*, is more like *SimCity* with a Latin face than *Hidden Agenda*'s labyrinthine tour of Latin American politics. Does this matter? No. *Tropico* is still great fun.

As in *SimCity*, you begin *Tropico* by configuring your island. Once you've defined the island's physical characteristics—such as size, population, and mineral deposits—you develop a leadership persona. Built from dozens of positive and negative traits, your persona affects your income, rapport with native political factions, and relations with foreign powers. For example, if you choose a background as a developer, you'll earn bonus points with capitalists, a negative rating from environmentalists, and double the pollution. In addition, you choose personal objectives as well as a length of time (up to 70 years) to rule or ruin your island realm.

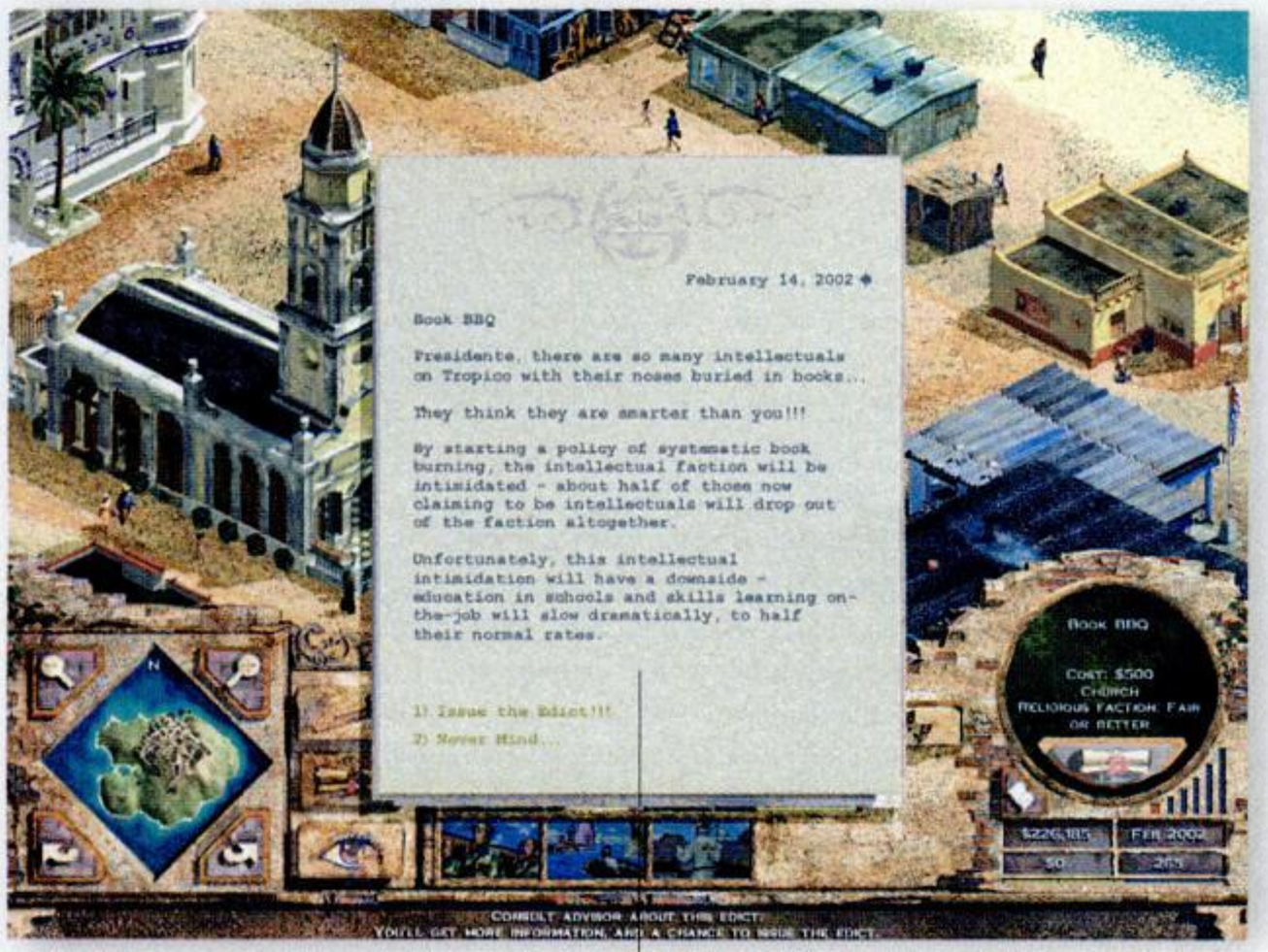
Just like *SimCity*, *Tropico*'s gameplay primarily involves the placement of structures. Development encourages immigration, generates income, and boosts education levels (a requirement if your island needs police or college professors). The challenge is that you never have enough money to do all the things you want, and you always have to please different factions to stay in power. Should your construction workers build a cigar factory or a cathedral? Will the income from a new casino justify an increase in crime?

It's your call, and you'll have to answer for it eventually—your people demand elections every few years. You could ignore their cries and hire more military, but this lowers your liberty rating and makes the United States dislike you. (Goodbye, foreign aid!) What's more, some citizens might protest or even take to the hills and become rebels. This would make you dreadfully unpopular, of course, and you're out of a job if your palace is destroyed. You can heed the people's will and schedule elections, but then you have to decide whether your elections will be honest or corrupt. You also have many powerful edict options, including a nationwide tax break, a papal visit, bribes for faction leaders, and assassinations. Like everything else in the game, each edict option can evoke both rewards and penalties.

Though *Tropico* supplies many strategic options, the game still has a number of disquieting flaws. Scrolling is extremely slow, even with a fast machine. The graphics, while good, aren't noticeably high-end and shouldn't cause such a drag on performance. Also, game elements sometimes have strange and even contradictory responses. Mines sometimes turn up empty even though they're placed directly on, or very near, spots showing a high ore concentration. Factions listed as "cordial" have leaders with a "troubled" attitude toward your policies, while factions listed as "cool" have leaders who are "pleased."

But, overall, *Tropico* is a unique take on the burgeoning Sim-whatever genre. It provides many challenges and lots of non-linearity (which is an important measure of a good strategy game), all wrapped up with clean graphics. You can succeed as a militaristic dictator, a capitalist weasel with a Swiss bank account, or a rubberstamping tool of the Communists. It's up to you to find your own way to respond to changing opinions and economic conditions.

—BARRY BRENESAL



Burn 'em! If your people get uppity from reading too many intellectual tomes, you can always clean out the libraries with a book-burning edict.

MAXIMUM PC VERDICT

Tropico
POPTOP SOFTWARE

+ WHAT WE LIKE

Cook elections, impose martial law, or call in the Pope to calm the revolting hordes. This is lots more fun than building bridges.

– WHAT WE HATE

It's hard to oversee your tropical empire with sluggish scrolling and conflicting messages from faction leaders.

PHONE 214.303.1202
www.poptopsoftware.com
$40

8

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Infinite Loops

A lisping scientist, lush environments, an indecisive wuss, and plenty of percussion

XCom Enforcer

The original *XCom* was a turn-based tour de force that still has hordes of fans waiting for a remake. Those fans will have to keep waiting because this ain't it. Instead, *Enforcer* is a third-person arcade/action romp set in the XCom universe. The plot concerns a lisping scientist who builds a massive robot called Enforcer just in time to stop a massive alien invasion. You must pilot the robot through level after repetitive level of urban environments to rescue humans, fetch power-ups and alien artifacts, and destroy alien teleporter machines. Killing aliens nets you research points (the only real nod to the original game), which can be used to buy upgrades and new weaponry. The game is initially a hoot to play, but the fun wears off extremely quickly.

WHAT WE LIKE: Excellent graphics, serious carnage, lots of scary aliens, and a cool upgrade screen.

WHAT WE HATE: The price is too high for repetitive and mindless action that's way too easy for any seasoned gamer or arcade player.

—ANDREW S. BUB

MAXIMUM PC VERDICT: 5

$29, Infogrames, www.us.infogrames.com

Evil Islands: Curse of the Lost Soul

Nival Interactive, developer of the **lackluster** *Rage of Mages* series, has finally produced a game worthy of the RPS genre. *Evil Islands'* generic amnesia-stricken-protagonist-fighting-for-clues-to-his-past storyline perks up with addicting tactical battles and insanely long hours of questing.

WHAT WE LIKE: Open-ended character construction ignores traditional RPG class selection and allows for player-specific development. Beautiful 3D landscapes combined with a rotating/zooming free camera and tactical pause-and-aim combat fit the strategic theme fabulously. Combining runes and material retrieved from adventuring lets you construct unique spells and weapons, provided your character meets the requirements.

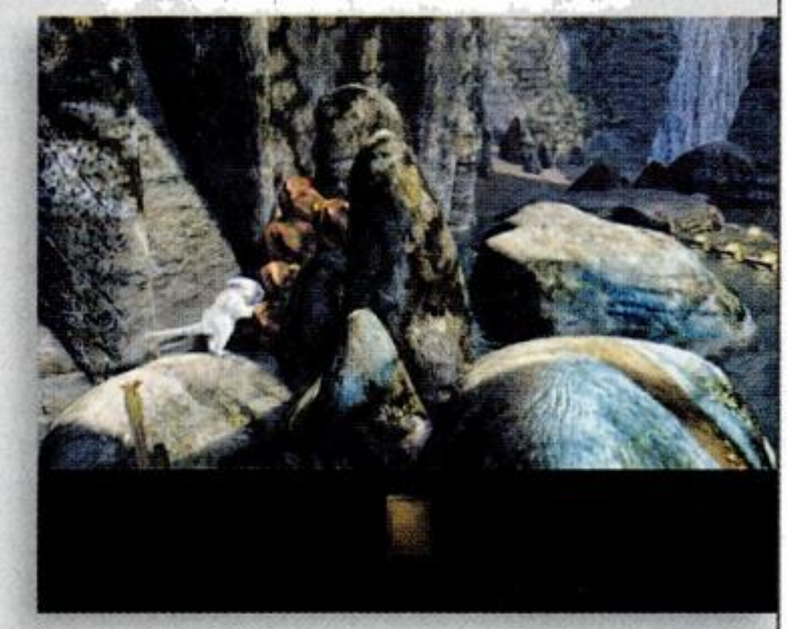
WHAT WE HATE: An unconvincing hero and poorly-voiced dialogue made us cringe. Enemies are too good at landing critical hits, which means you spend exorbitant amounts of time finishing relatively insignificant battles.

—JASON GORSKI

MAXIMUM PC VERDICT: 8

$40, Fishtank Interactive, www.fishtankgames.com, 603.382.0572

Myst III: Exile



A crazy number of copies of *Myst* and *Riven* were purchased and are the reason great-aunts own PCs. Now Presto Studios, which created the *Myst*-y *Journeyman* trilogy, takes over the reins of the franchise.

WHAT WE LIKE: Smooth panoramic landscapes eliminate that old, slideshow feel. Live video is mixed reasonably well into the pre-rendered 'scapes. Lessons about the behavior of certain items and how plants and animals react to your actions come in handy later.

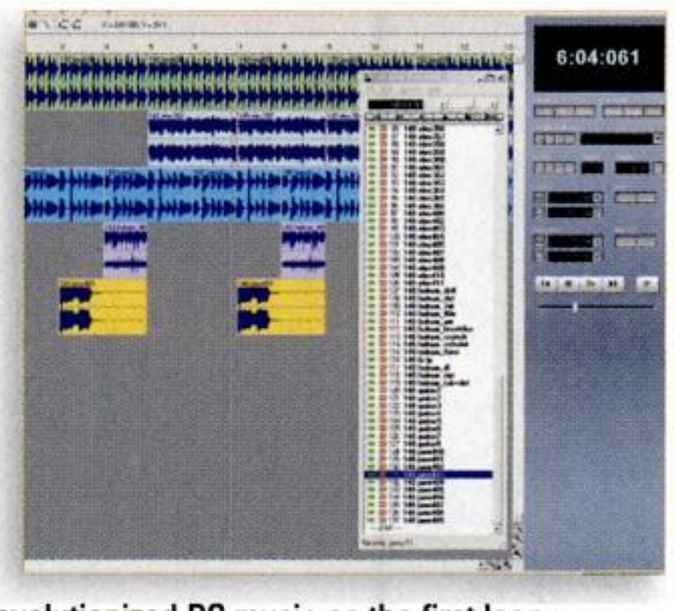
WHAT WE HATE: There are still far too many "weights and balances" puzzles. The adrenaline level is still practically zero. Atrus, creator of all the worlds in these games, comes off as an indecisive wuss.

—JASON COMPTON

MAXIMUM PC VERDICT: 5

$40, Ubi Soft, www.myst3.com, 415.547.4000

Club Tracks



The late-1990s rave-music surge deepened the cult of the DJ and brought respectability to loop-based composition. Cakewalk, which makes the best-selling PC music production application, *Cakewalk Pro Audio*, joins the fray with *Club Tracks*. Unfortunately, *Club Tracks* inevitably competes with Sonic Foundry's *ACID*, which revolutionized PC music as the first loop-based audio production application.

WHAT WE LIKE: *Club Tracks* uses *Cakewalk's* familiar editing and mixing views and comes with a full CD of quality loops, from beats to synths to vocals, all oriented toward dance-track production. Best of all, *Club Tracks* comes with a copy of *Fruityloops Express*, one of the best software synthesizers for creating custom loops.

WHAT WE HATE: The overall feel just isn't any fun. Nested menus and complex project views feel more like a production environment than the on-the-fly, cut-and-mix approach that made loop-based composition in *ACID* so popular.

—ROB PRATT

MAXIMUM PC VERDICT: 6

$49, Cakewalk, www.cakewalk.com, 888.225.3925

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Winner of Maximum PC's "Clash of the Gaming Titans"

"In terms of pure price-to-performance ratio, Falcon takes the cake."

"Because the Falcon won every benchmark, the scores of the other machines are represented as percentages of the Falcon's scores..."

"In this roundup, the best system is also the least expensive."

Maximum PC
May 2001

"The Falcon Northwest Mach V demonstrates the most consistently strong performance across all tests."

"the Mach V beat out the Alienware Aurora DDR system in all the 3D game tests by a steady 5 percent"

Gamespot Hardware,
Clash of the Titans Faceoff
April 2001

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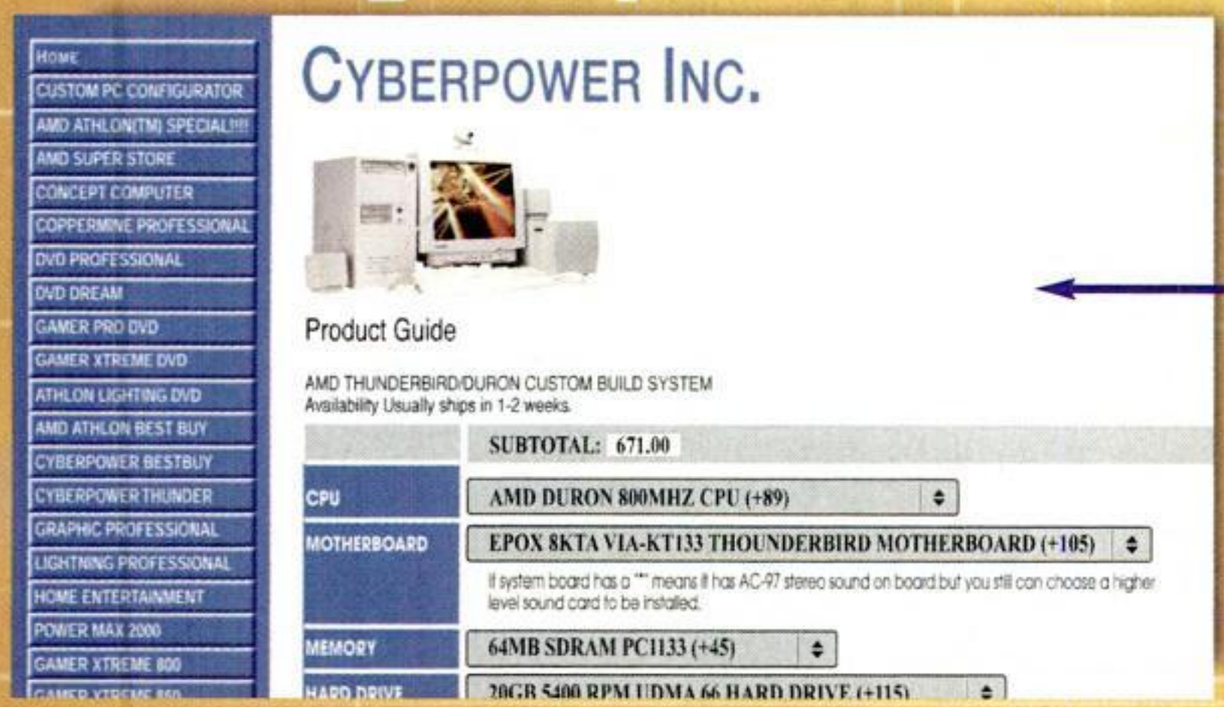

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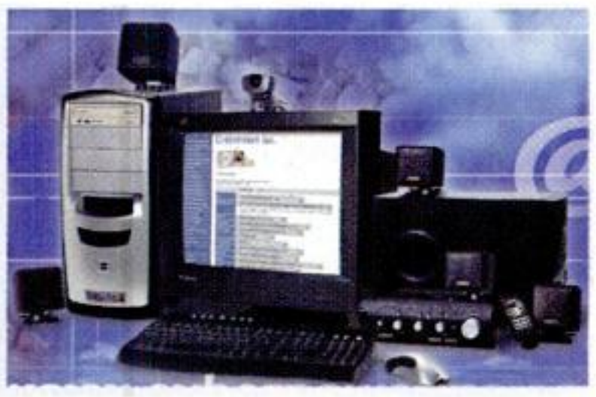

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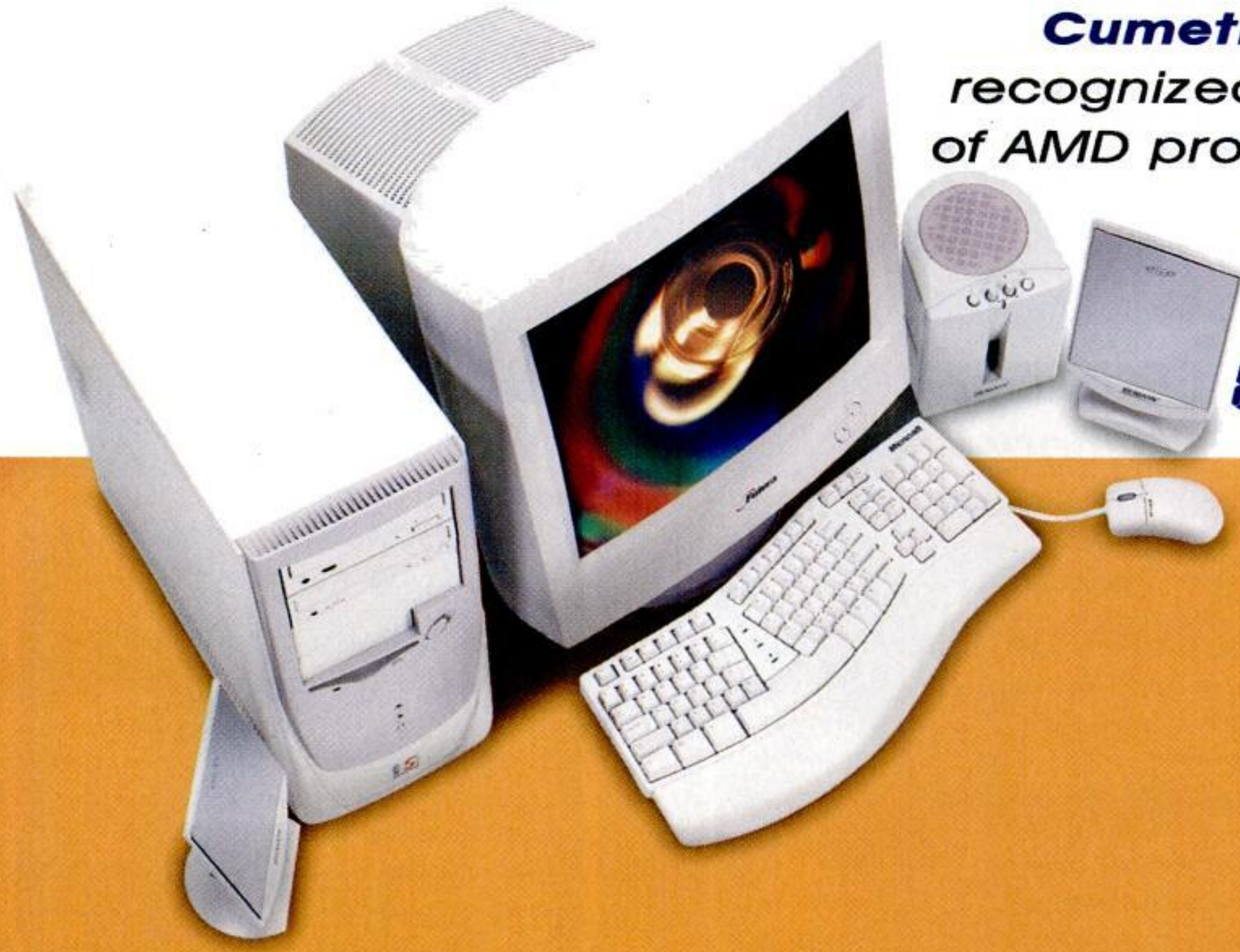

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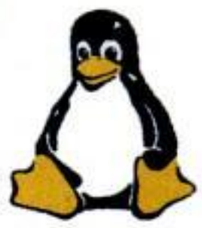

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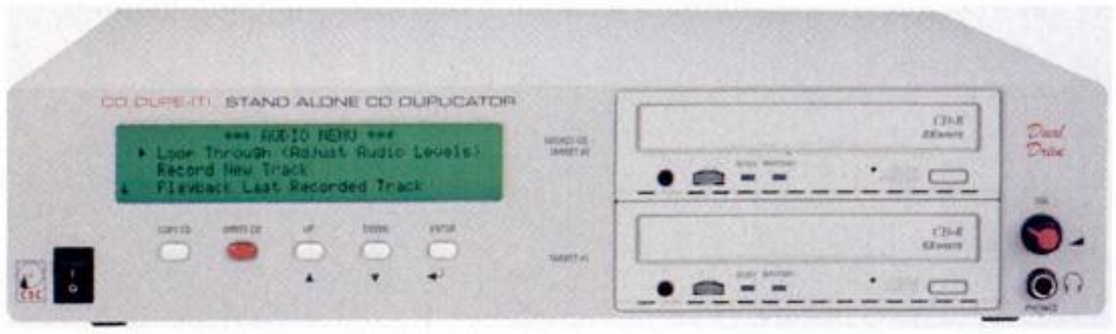

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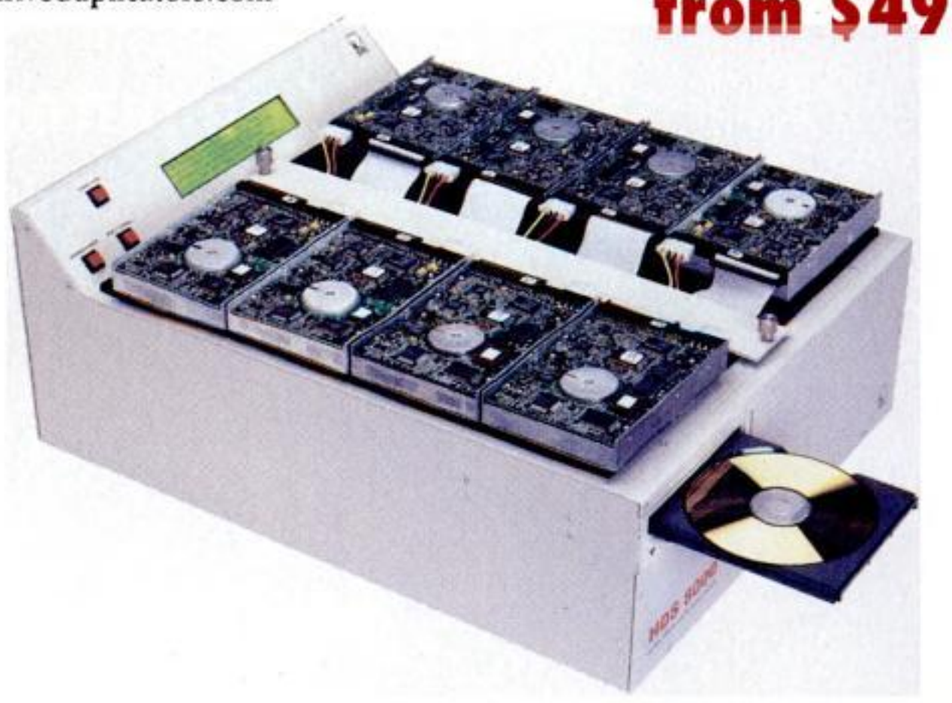

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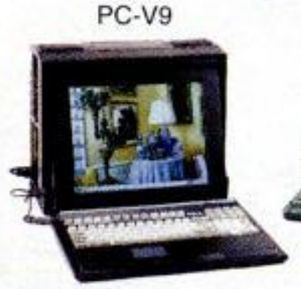

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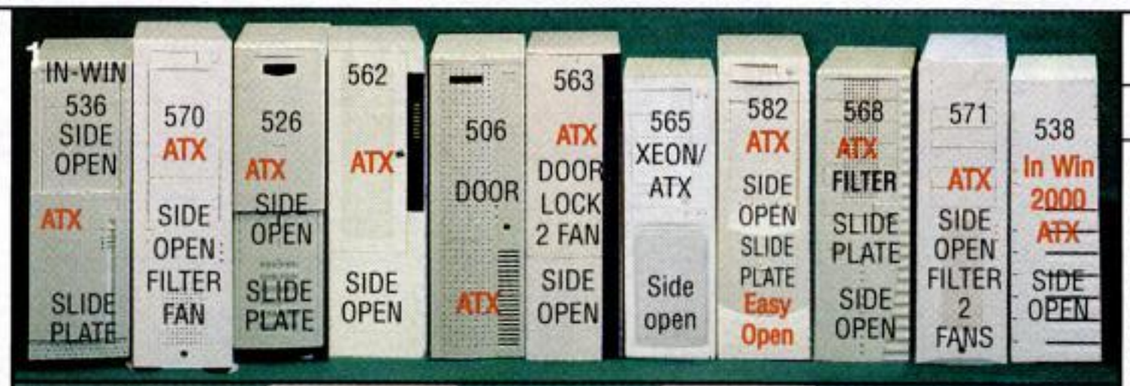

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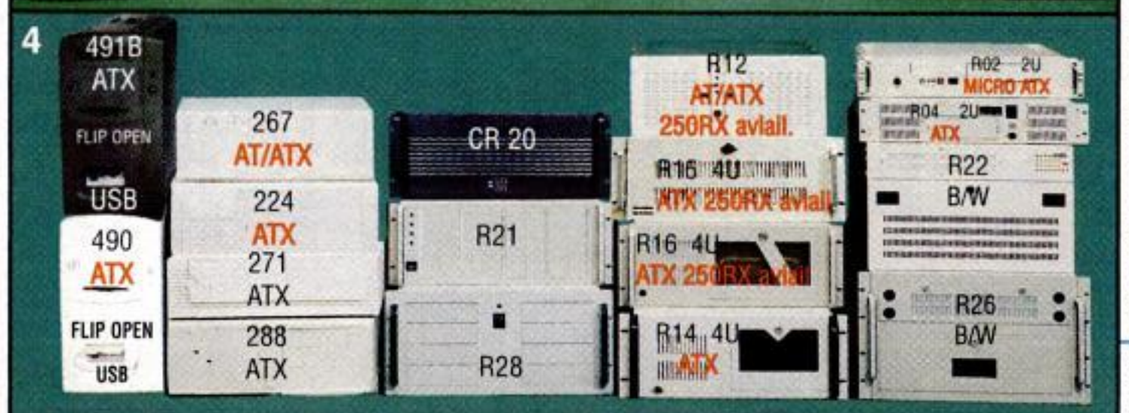

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105LPX socket 370	375	11.9x12.6x3.4	PS2 KB,mouse,VGA,USB,RJ45,2S,1P,AUDIO,GAME, IR	1	1/1	2	0
106 socket 7	260	12.4x14.5x3.4	PS2 KB,mouse,VGA,USB,RJ45,2S,1P,AUDIO, GAME	1	1/1	2	or 0
108NLX socket 370	375	12.4x14.5x3.4	PS2 KB,mouse,VGA,USB,RJ45,2S,1P,AUDIO,GAME, IR	1	1/1	2	or 1
192 370/II Micro ATX	220	12.1x16.5x3.5	PS2 KB, mouse, VGA,2S,1P,AUDIO	1	1/1	2	& 0

Case Specification & Price List

Model	Price	Dimension W.D.H.	MB Size	5.25 Ext./Int.	3.5 Ext./Int.	P.S.
R02 BARE	300	19x17.6x3.5	M.ATX	1/0	1/1	150W
R04B/W	290	19x24.3x3.5	ATX	1/0	1/3	250W
R08 B/W	1675/2300	19x22x3.5				
R12 B/W	305	19x19.7x7	B/ATX	4/0	1/0	250W
R14 B/W	230	19x21x7	B/ATX	3/0	1/3	300W
R15	325/550	19x24.4x7	ATX	6/0	2/2	300W
R16 B/W	240	19x18x7	B/ATX	3/0	1/2	250W
R20 B/W	290	19x20.5x7		8/0		300W
R21 B/W	290	19x18x7		8/0		300W
R22R/B/W	635/950	19x23.3x10.5	ATX	8/0	1/0	300W/R
R26R/B/W	630/850	19x22.6x10.7	ATX	4/0	2/4	300W/R
R28	290	19x17x8.7		8/0		300W
RSP	18	5.8x9.3x1.6			1	
RSM169	65/75	5.8x9.3x1.6			1	
001B	75	10x11.5x3		1/0		60W
001B1	65	8.3x10.6x2.8		1/0		50W
002B	88	6.9x14.6x5.8		2/0		60W
002B1	78	7.5x11.2x6.5		2/0		80W
004B	105	6.8x15.3x9.3		4/0		230W
004B1	100	7.5x17.3x10.2		4/0		200W
007B	180	7x15.8x13		7/0		250W
008B	280	8.4x20.2x18.3		8/0		300W
008B1	180	7.5x17.9x17.1		8/0		250W
103LPX	330	12.4x14.5x3.4	LPX	1/0	1/1	85W
104NLX	460	12.4x14.5x3.4	NLX	1/0	1/1	85W
105LPX	375	11.9x12.6x3	LPX	1/0	1/1	90W
106LPX-7	260	12.4x14.5x3.4	LPX	1/0	1/1	85W
108NLX bare	375	11x13.6x3.4	NLX	1/0	1/1	135W
192M.ATX	85	13.1x16.5x3.5	M.ATX	1/0	1/1	150W
224	75	17.4x18.8x6.1	ATX	3/0	2/2	230W
267	75	16.8x16.8x6.2	ATX	2/0	2/1	250W
271	90	17.3x15.9x5.5	ATX	2/0	1/1	250XB
288	75	16.9x17x6	ATX	3/0	2/1	230W
325B	75	8x18.5x17	ATX	3/0	2/1	235W
327	72	7.5x16.5x17.3	ATX	3/0	2/2	230W
337	88	7.8x18.8x16.5	ATX	3/0	2/2	300W
338	55	7x14.7x13.8	M. ATX	2/0	2/1	145W
366	50	7.2x15.5x14.3	M. ATX	2/0	1/1	235W
367	55	7.7x16.5x17	ATX	3/0	2/1	235W
370	89	8.3x17.3x16.1	ATX	3/0	2/2	250WB
392	80	7.5x17x17	ATX	3/0	2/2	250W
393	95	9x17.5x17.5	ATX	6/0	1/1	250W
396	55	8.3x17x15.5	ATX	3/0	1/3	230W
401	110	8.5x17.3x18	ATX	2/0	2/2	250W
408	80	8.2x19.8x18.4	ATX	3/0	1/5	250W
411	62	7.2x17.2x16.8	ATX	4/0	2/1	250W
412	62	7.2x17.2x16.8	ATX	4/0	1/2	250W
413S/BL	62	8.5x19.5x18	ATX	4/0	2/1	250W
414P	62	7.2x20x16.8	ATX	4/0	2/1	250W
422	70	7.7x16.6x18.1	AT	4/0	1/4	250W
424	70	7.5x18.9x16.7	ATX	4/0	2/1	250W
426B/W/S	80	7.5x17.5x19.3	ATX	3/0	2/2	250W
436	70/85	8.6x18x15.6	ATX	3/0	2/2	250/300W
455	110	8.5x17.5x18.6	ATX	4/0	2/3	250W
465	195	9.3x17x17.2	XEON/ATX	2/0	2/2	300W
467	85/100	7.5x16.7x18.8	ATX	3/0	2/4	250W/300W
470	110	8.3x17.3x21.3	ATX	4/1	1/2	250WB
472	60	7.5x18x17.6	ATX	4/0	2/2	250W
482B	80	7.8x19.8x17.5	ATX	4/0	2/2	250W
486	67	9.6x19.5x17	ATX	4/0	2/1	250W
489**	85	7.3x17x17	ATX	3/0	1/2	235W
490	70	8.5x15.5x15	ATX	2/0	2/2	250W
491B	70	8.5x15.5x15	ATX	2/0	2/2	250W
496	60	8.25x17.8x16.5	ATX	4/0	1/3	250W
501	185	8.25x17.2x23.8	ATX	4/0	2/4	300W
503R/B	455	14.8x20.4x18.4	ATX	8/0	2/4	300RW
503/B	305	14.8x20.4x18.4	ATX	8/0	2/4	300W
505	510	14.6x23x26.8	ATX	12/0	1/8	300W
505R	705	14.6x23x26.8	ATX	12/0	1/8	300RW
506/R	155/370	7.8x16.5x24.4	ATX	6/0	2/2	300W/R
524	380	13.9x25.6x19.1	ATX	7/0	1/2	300RW
526B/W	105/120	7.5x17.5x24.5	ATX	6/0	1/4	250W/300W
528	95/110	7.5x16.5x24.8	ATX	6/0	1/5	250W/300W
536	93/108	7.8x17x24	ATX	5/0	1/5	250W/300W
538	290	8x20.5x24.5	ATX	5/0	1/6	300RW
555/B/R	440/680	11x19.3x23.6	F	4/8	0/0	400W/300R
555/R	440/700	11x19.3x23.6	ATX	4/8	0/0	300W/300R
560/R	290/445	15x24.5x23.5	ATX	11/0	2/4	300W/300R
562/R/B/W	250/470	8.7x17.9x26.8	ATX	9/1	1/0	300W/300R
563/RB/W	145/370	8.7x17.9x26.8	ATX	10/0		300W/300R
565	195	9.25x18.3x21.2	XEON/ATX	4/0	2/4	300W
568	105/120	7.5x17x22.8	ATX	5/0	2/4	250W/300W
569B/W	225	13.5x17.8x14	B/ATX	6/2	0/8	300W/300W
570/R	150/370	8.3x17.3x26.4	ATX	7/1	1/2	300W/300R
571/R	160/370	8.3x17.3x26.4	ATX	6/1	1/2	300W/300R
582	105/120	7.8x16.5x23.2	ATX	6/0	2/1	250W/300W
588	105/120	7.8x16.5x23.3	ATX	5/0	1/3	250W/300W
1400/R	715	16x20x24	F/ATX	14/0		300R
1620/R	950	16.5x20.3x34.3	F/ATXx2	16/0		300R

*Case Color: Blue, Purple, Green, Orange, Red.
**Case Color: Blue, Purple, Green, Red, Black.

Model# Starts with:
1 for Slim Case
2 for Desktop Case
3 for Mini-Mid Case
4 for Mid Case
5 for Full/File Server Case
Side Open: Side Panel can be removed independently
Slide Door: Sliding front door up and down
Slide MB Plate: Motherboard tray ca slide in and out form rear

MB SIZE = MOTHERBOARD SIZE • F= FULL SIZE • B= BABY SIZE
X=ATX • M. ATX= Micro ATX
R= REDUNDANT POWER SUPPLY WITH HARDSWAP
250XB= Ball Bearing

Motherboards

Socket 370 Motherboards for Intel Pentium III and Celeron
Asus CUV266, DDR suprt, w/256mg $272
Asus CUV4X-D, Dual 370, VIA $177
Asus CUV4X-E, VIA, U100, Audio $123
Asus CUV4X-V, VIA, Video, Audio $126
Asus CUSL2, Intel 815, U100, video $159
Asus CUSL2-C I815 AGP4x,ATX, $136
Tyan S1854, 370 & slot 1, ATX $106
Tyan S2420, Video, Lan, Audio $159
Abit SE6, I815, Audio, VGA $151
Abit VL6, VIA, Audio, $90
Abit VP6, VIA, U100, Raid 100, 165
Abit VH6-2, U100, VIA chipset, $104
Abit BX133, U100, Raid $136
Abit KT7E, VIA, U100 $114
Microstar MS6321, Dual 370, U100 $124
Microstar MS632R, Dual 370 Raid U100 $144
Microstar 815EP-R, Raid U100, I815 $136
Microstar 815EP-L, Lan10/100, I815 $104
Microstar Pro266, DDR266, VIA $139
Microstar Pro266R, Raid, DDR266, $152
FIC FA11, VIA, U100 $77
Tyan S2505, Dual 370, Lan, U100, VGA, VIA chipset $270
Tyan S2510NG, Dual 370 Server, 433

Socket A Motherboards
(AMD Thunderbird/Duron)

Asus A7V133, VIA, Raid 0, AGP4x $158
Tyan S2390B, VIA, U100 $123
Abit KT7A, VIA, U100, AGP4x $143
Abit KT7ARA, Raid U100, AGP4x $161
FIC AZ11-EA, 266FSB, U100 $108
Gigabyte 7DX, DDR266, U100 $188
Gigabyte 7ZXR, U100, VIA $140
Microstar K7T-266R, DDR266, Raid, $175
Microstar K7T-266, DDR266, U100, $159
Microstar, K7T-TBR, 266FSB, Raid $135

Pentium 4 Motherboards
Abit TH7-Raid, U100 Raid, Audio $203
Intel D850GB, I850, U100 Rambus, $210
Asus P4T, I850, U100, Rambus, $216

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Western Digital 30 gig U100 7200, $131
Western Digital 40 gig U100 7200, $149
Western Digital 60 gig U100 7200, $177
Maxtor 20 gig U100 7200 rpm, $106
Maxtor 30 gig U100 7200 rpm, $133
Maxtor 40 gig U-100 7200 rpm, $154
Maxtor 61 gig U100 7200 rpm, $218
Maxtor 81 gig U100 5400 rpm, $257
IBM 20 gig U100 7200 rpm, $114
IBM 30 gig U100 7200 rpm, $149
IBM 40 gig U100 7200 rpm, $159
IBM 60 gig U100 7200 rpm, $239
IBM 75 gig U100 7200 rpm, $303
Seagate 10 gig 5400 rpm, $83
Seagate 20 gig 5400 rpm, $90
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Promise Fast Trak 100 raid/mirror card $99
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Sound Blaster Live X-Gamer 5.1 $95
Sound Blaster Live MP3+ 5.1 $94
Sound Blaster Live Value $62
Sound Blaster PCI 128 $35
Diamond Monster MX 400 $49

Memory

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128 megs	$54	with ECC $65
256 megs	$96	with ECC $125

RamBus RDRam
128 meg 800 MHz $104,
256 meg 800 MHz $232

SDram 168 pin dimms
(Memory Made by Micron)

	PC-133	PC-100	PC-66(not Micron)
64 megs	$21	$23	$24
128 megs	$36	$36	$41
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512 megs	$186	$186	

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Intel Pentium 4 for Socket 423 Motherboards
All come with 128mega RDRam
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Intel Pentium III Processors
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850 MHz (100)$187 866 MHz (133) $187
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For Socket 7 Motherboards
K-6-2 500 MHz. $45 K-6-2 550 MHz. $50

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1.3 GHz.(266 bus) $342

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Cooler Master Extra Lagre Heatsink and Cooling Fan
System is assembled and burned in for 48 hours

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AMD T-Bird 1.2 GHz (266 FSB) $397
AMD T-Bird 1.3 GHz. (266 FSB) $554
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FIC AZ11-E Motherboard with U100 Support
Mid Tower Case with 300 watt ATX power Supply
System is assembled and burned in for 48 hours

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AMD Duron 800 MHz. $261
AMD Duron 850 MHz. $271
AMD Duron 900 MHz. $282
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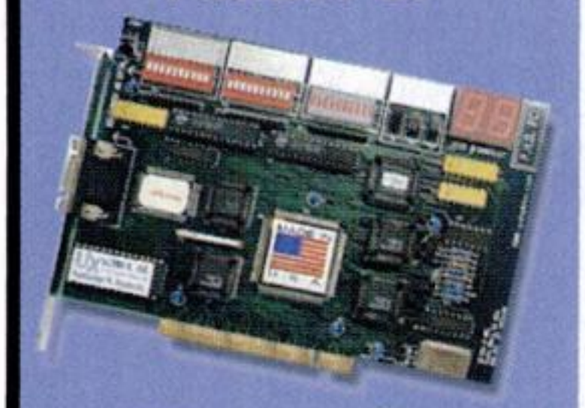

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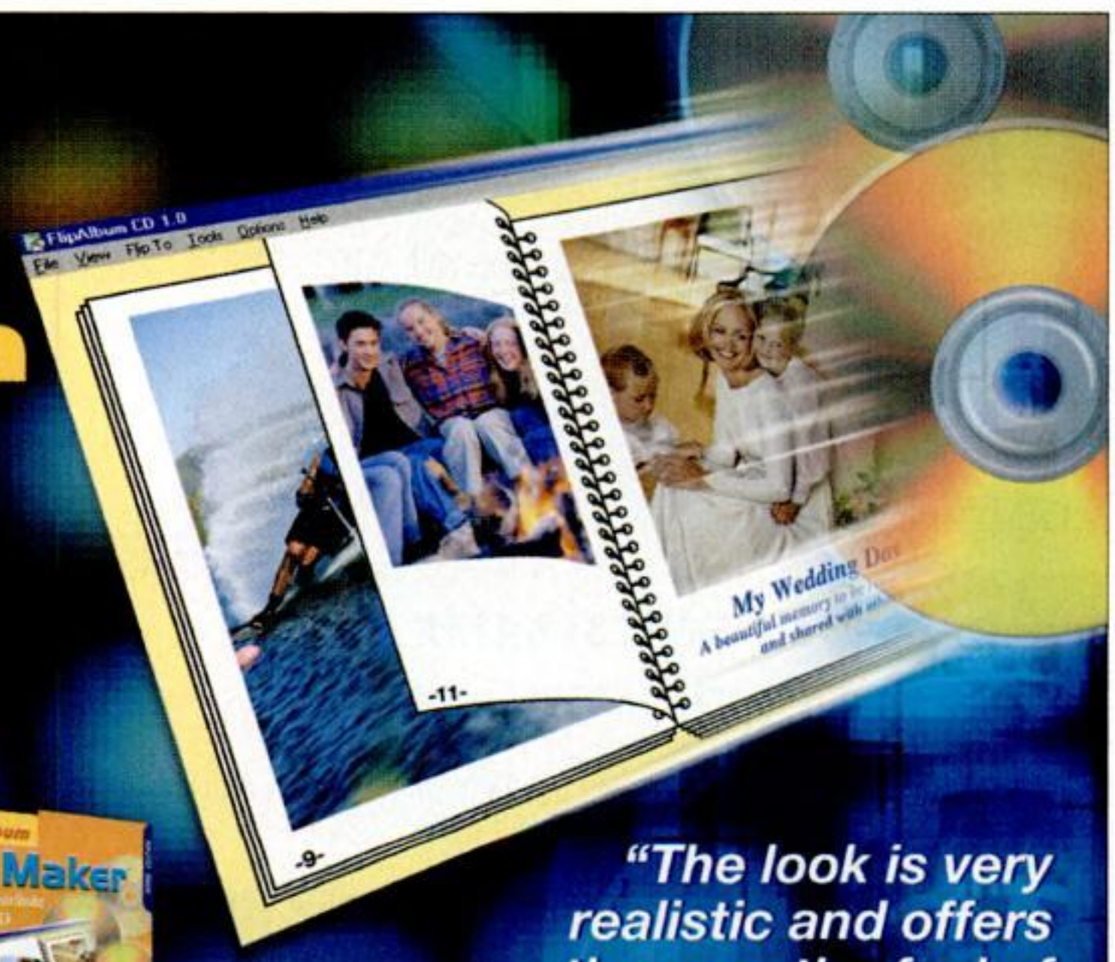

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Coming Next Month

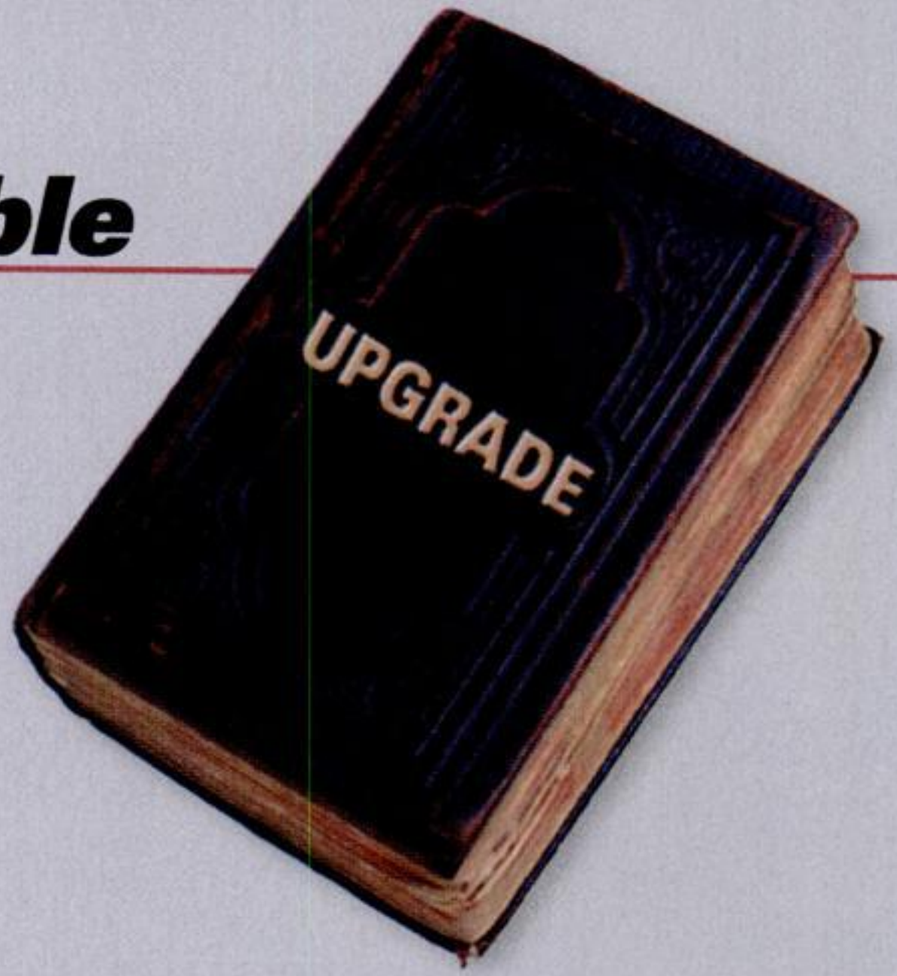
IN THE MAXIMUM PC AUGUST ISSUE!

Ultimate Upgrade Bible

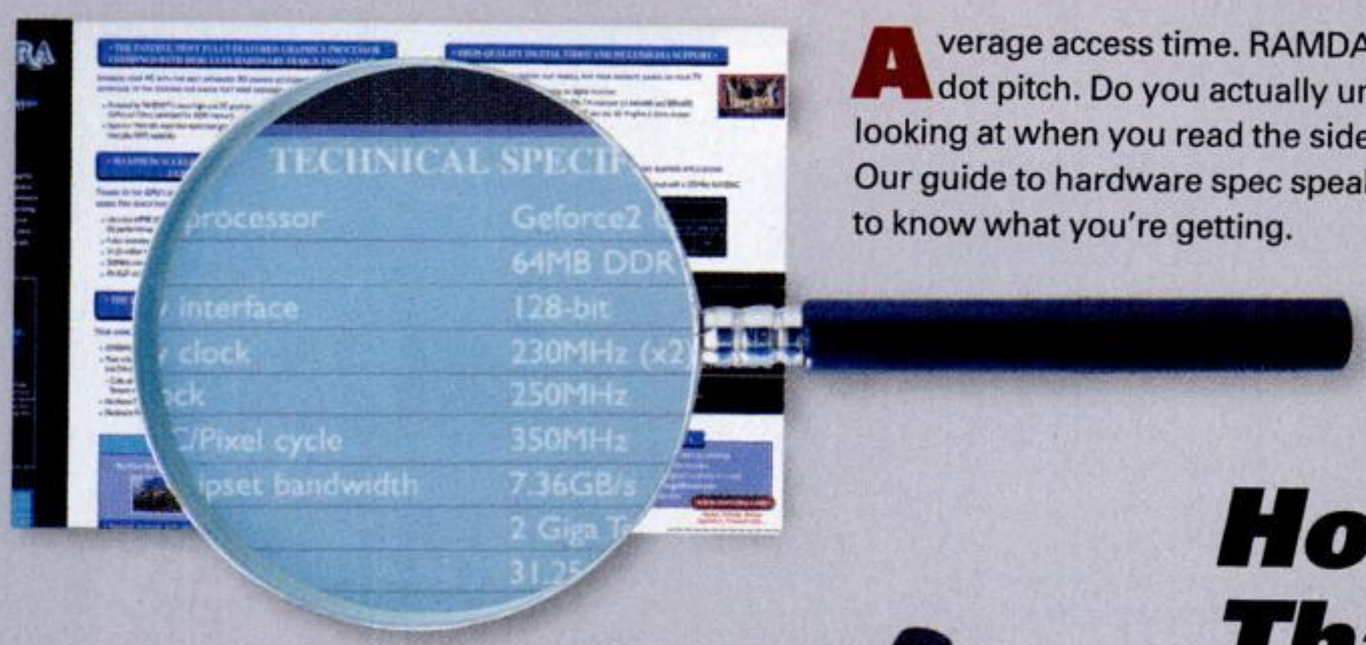
Commanding your PC to put forth superior performance may simply be a matter of replacing its prehistoric parts. Next month, we explain how to upgrade each and every aspect of your aging rig. Upgrade candidates include your:

- **videocard**
- **soundcard**
- **optical drives**
- **hard drives**
- **monitor**
- **speakers**
- **removable storage**
- **keyboard, mouse, and game controller**

Plus, we'll have a special section on upgrading your CPU, memory, and motherboard, as well as our list of 10 Upgrading Commandments.



Sprechen sie Specs?



Average access time. RAMDAC frequency. Horizontal dot pitch. Do you actually understand what you're looking at when you read the side of a hardware box? Our guide to hardware spec speak will show you how to know what you're getting.

Wireless Field Day

Can you really stay fully connected when you're away from your desktop PC? Three *Maximum PC* editors are sent on a wild road test with three different wireless setups. Who can get his work done most efficiently and with the fewest scratches and abrasions?

How They Do That Voodoo That They Do

Voodoo Computers creates custom-built computers that are aesthetically amazing on the inside as well as on the outside. We detail Voodoo's most marvelous interiors and speak with the origami master who's responsible for those gorgeous wiring jobs.

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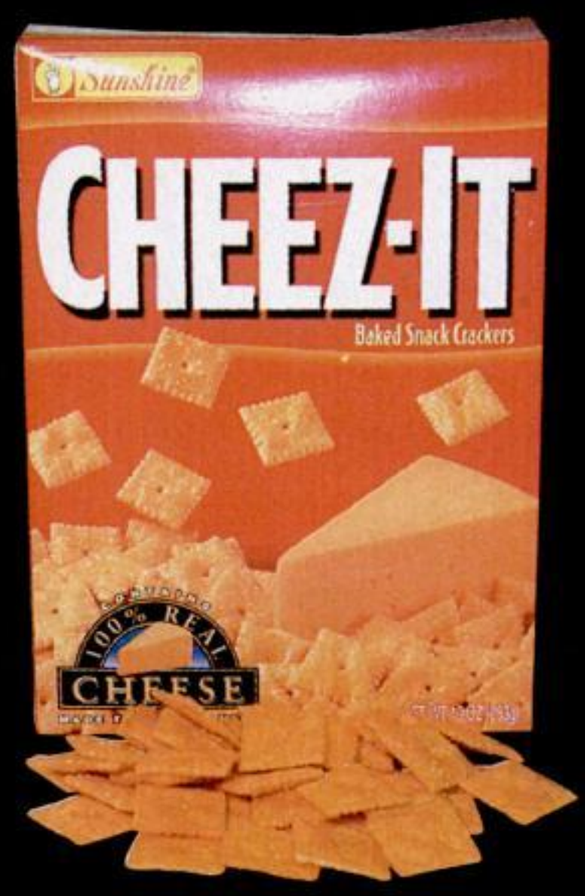
Exit
The last page of the magazine

Keyboard Cuisine

A selection of fine processed foodstuffs for the discerning non-ambulatory computer enthusiast.

Orangina Sparkling Citrus Beverage
2000 was a banner year for the darker sodas, particularly the boutique root beers and creams. But amid the hubbub surrounding these highly carbonated brunettes emerged an atypically daring vintage of Orangina that will not soon be forgotten. With just a suggestion of effervescence and a back-story more tangerine than orange, this citrusy flirt will steal your heart with a curtsey and a wink. Best enjoyed while blowing the living crap out of lame-o loser bastards in *Quake III Arena*.

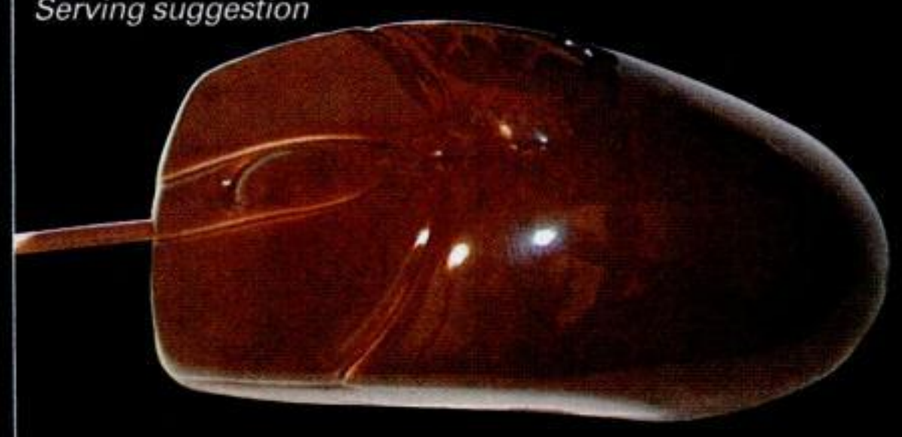


Cheez-It Baked Snack Crackers
The year was 1999. The dot-com explosion was just reaching fever-pitch, and Jason Kane, an idealistic banner-ad designer, was working until 11p.m. for the 22nd day in a row. Utterly famished and without hope of a pizza delivery at such a bewitching hour, Kane wondered if he might not die of hunger right in his cubicle—so rich in stock options, yet so poor in food options... the irony did not elude him. And then he saw it, a renegade Cheez-It that had escaped the doughy clutches of Feldman and lodged itself into the crevice between his cubicle mate's Delete and End keys. Kane liberated the piquant cracker, ate it, and pushed on, fully energized by a carbo-density unparalleled in the snack food universe.

Although Kane is now unemployed and destitute, Cheez-It snack crackers endure, impervious to the whimsy of an ever-fluctuating economy. We suggest you serve your Its with a can of compressed Whiz, and enjoy a relaxing night of porn surfing. We trust the experience will change your life.

Smucker's Magic Shell Topping
Non-ambulatory computer enthusiasts love fine processed foodstuffs—and all fine processed foodstuffs taste better when encased in a dreamy Magic Shell. Your older brother might have poured it on ice cream during a rousing game of *Dungeon Keeper*, but today's "hep cats" like to apply Magic Shell to frozen yogurt, and then enjoy a night of *Dungeon Keeper 2*. Ah, yes, times have changed. But the magical chocolate sauce that seemingly defies the laws of physics remains a constant computing favorite.

Serving suggestion



Hot Tamales
Chili verde... Chicken mole... Steak fajitas. Americans adore fine Mexican cuisine, but American computer enthusiasts reserve a special place in their tummies for Hot Tamales, arguably the finest delicacy imported from our cousins to the south. To truly appreciate these zesty sugar treats, they must be eaten five at a time while playing *Solitaire* or *Minesweeper*. Any computer activity more complex would surely detract from the Tamales' performance.

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Dell™ Dimension™ 8100 Desktops Feature the Intel® Pentium® 4 Processor

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- 32MB NVIDIA® GeForce2 MX 4X AGP Graphics with TV Out
- 8X/4X/32X CD-RW Drive
- Turtle Beach® Santa Cruz™ DSP Sound Card
- Harman Kardon® HK-695 Surround Sound with Subwoofer
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- 8MB ATI® Rage Mobility™ 128 3D® 2X AGP Video
- Internal 56K Capable[6] FaxModem
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- 10GB[5] Ultra ATA Hard Drive
- Modular 8X Max CD-ROM Drive
- 8MB ATI® Rage Mobility™ 128 3D® 2X AGP Video
- Internal 56K Capable[6] FaxModem
- 26.5WHr Li-Ion Battery w/ExpressCharge™ Technology
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- Internal 56K Capable[6] FaxModem
- 59WHr Li-Ion Battery ■ harman/kardon® Audio
- MS® Works Suite 2001 ■ MS® Windows® Me
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- Fixed 8X Max DVD-ROM Drive
- 8X Max CD-RW Drive
- 32MB NVIDIA® GeForce2 Go™ 4X AGP Graphics
- Internal 56K Capable[6] FaxModem
- 59WHr Li-Ion Battery w/ExpressCharge™ Technology
- MS® Works Suite 2001 ■ MS® Windows® Me
- 1-Yr Limited Warranty[2] ■ 1-Yr Mail-in Service
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